University of Alberta

Independent Learning using Technology and the Gifted Student

by

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Abstract

The purpose of the study was to examine the experiences of three gifted students, two high school and one elementary, as they independently worked on exploratory learning projects using technology. The study provides descriptions of the students' experiences while working on their projects, through interviews and observations.

A case study approach was taken to achieve this, using observations and open-ended questions to collect the data. Themes of Student Learning, Student Involvement and Motivation, Impact of Technology, What Worked Well in this Innovation and the Student Planning Process are among the findings of this study.

Results of this study revealed that the students demonstrated a high level of involvement and motivation. Student research and use of technology both impacted student learning. The students expressed clearly what can happen to their learning and motivation when allowed to explore independent learning projects using technology.

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Chapter 1 - Introduction

Introduction

The use of computers in instruction has been explored since the 1950s (Szabo, 2000), since then research on the effectiveness of computers as both an instructional and cognitive tool has been extensive (Nugeni, 2001, Bulls & Riley, 1997, Saettler, 1990). Gifted students are generally considered to be strong in logical reasoning and usually have an ability to grasp abstract concepts in curricular areas such as Math and Science (Kalchman & Case, 1999, VanTassel-Baska, 1998). The strengths demonstrated in Math and Science has led to the reasoning that these students would also excel in the area of technology (Kalchman & Case, 1999, VanTassel-Baska, 1998).

Despite the extensive research on the effectiveness of computers in school, little has been studied in the area of giftedness and technology (Riley & Brown, 2001). Most studies within this area have been case studies with sampling often being extreme in nature primarily dealing with gifted students in special schools (such as magnet or private schools) or programs and not necessarily directly applicable to gifted students in integrated classrooms within public schools (Adams & Cross, 2000, Cohen, 1997).

The target population for this study were gifted students within a rural Alberta School Division that for the sake of maintaining anonymity will be referred to as the Snowbird School Division. Gifted students in Snowbird School Division are integrated into regular classrooms and are limited by the rural locale of the jurisdiction. Resources and programs are scarce, professionals trained to work with these students are few and access to materials, experts and enhancement activities such as fieldtrips to locations like

Universities and museums are costly and not easily accessible.

A student is defined by this school division as being gifted if they have an IQ of greater than 125. Students are screened initially within their schools using the Kaufmann Brief Intelligence Test. Results from this testing are used to refer students to school psychologists for the Weschler Intelligence Scale for Children - Third Edition (WISC-III) test. Those scoring over 125 are then coded as gifted by the school division.

Need for the Study

As already mentioned little research has been done in the area of giftedness and technology (Riley & Brown, 2001). The Snowbird School Division had done little to enhance gifted education in its division. In the past, the division directed all of its special educational resources towards students with learning disabilities and no concerted effort has been given to addressing the needs of identified gifted students. The division has reached a point where resources, funding, extra assistance and individual program plans are well established with most identified special needs students, except for those having been identified as being gifted.

The Director of Special Education has recognized that while the division has implemented an effective program for students with learning disabilities and behavioral problems, little has yet been done to address gifted students' needs within the division. As such a new initiative to enhance programming for those students was started for the 2002- 2003 school year. The initiative focused upon identifying and implementing individual programs for identified gifted students. The types of programs developed were left to the special education coordinators at the individual school sites. The breadth and depth of the programs developed were shared with the division's student services team

during the 2003 – 2004 school year. This research study is a case study review of the approach taken by Beaver Ridge School within the Snowbird School Division.

Research Question

This study investigated the approach taken by one of the schools in Snowbird School Division, Beaver Ridge School, a K-12 school with 440 students that offers instruction in English, French and a Slavic language, in implementing an enhancement program for gifted students. The research study sought information to help answer the question: What might be discerned about how the learning, involvement, and motivation of gifted students are affected by an independent exploratory learning program involving computer technology?

Independent exploratory learning in the context of this study meant learning independently from classmates, outside of the classroom setting through the use of computer technology. Motivating students in the scope of this study meant ascertaining through interviews and observations whether the students' interest and desire to learn in their curricular area was increased. Also this meant determining whether the students were pushed to think critically, to use problem-solving skills, to analyze the information they found, evaluate the information in terms of its relevance to their project and present the information in a meaningful format.

In addressing this question, Beaver Ridge School chose to have gifted students independently research an area from within their current curriculum that was of particular interest to the student, this decision was reached by myself as the researcher for this study and the special education coordinator at the school. To minimize problems in subsequent years of the student's programs, it was agreed that the students not move forward in the

curriculum as part of any giftedness activity. Therefore, it was decided that students would first need to choose an objective in which they were interested, since they would be working independently and would require a certain level of self-motivation while working on this project. Secondly, as already stated student topic choices would need to be from the current curriculum and not infringe upon future curricular areas.

Students performed an in-depth exploration of the topic of their choice and presented their findings using a computer-based multimedia tool of their choice. Students worked on these projects once or twice a week in 42-minute periods for six weeks. The approach resulted in the students using computer technology to:

i. Research areas from the current curriculum in an in-depth manner. Students chose an area of interest, in consultation with their teacher from their current unit of study and further investigated the subject matter using the Internet for the most part independent of their classmates in a detailed and extensive matter.
ii. Gain experience with a variety of Internet tools, including searching websites, finding and downloading media clips and browsing listservs to gain data and information for their projects.
iii. Construct their learning. Students sorted, categorized and interpreted their research in relation to their curriculum area using a software program of their choice.
iv. Represent their learning. Students presented their results using a software program of their choice.

Sub questions arising from the research question and the approach taken by this school that were explored in this study included:

- What was discerned about how students are learning in this exploratory computer based setting?
- What was discerned about students' involvement and motivation in this exploratory computer-based setting?
- In what ways did each student's use of the available software applications augment or hinder his or her learning, involvement, and motivation?
- What aspects worked well in the students' projects and what changes should be considered if a similar program were to be used again within this school?

Description of the Site and Program

Beaver Ridge School is a small K- 12 school in a rural farming community. The community is primarily French Catholic with another large Slavic settlement situated outside of the town. There are single English classes in each grade from K – 12 and French Immersion is offered in split classes until grade 6. There are 23 full time teaching staff at the school, including the principal, assistant principal, special education coordinator and school counselor.

In the high school there is one specialist teacher per core subject, for example a Math teacher, a Language Arts teacher, a Social Studies teacher and a Science teacher. One exception is the Math teacher who teaches some of the lower level Science classes. There are three junior high teachers, a teacher for each French Immersion split class in K – 6 and one teacher for each English K – 6 class.

The community sees little in the way of new population growth, as there is little outside of farming to attract new families to the area. Most of the students in the school have been with the same classmates since kindergarten.

The school itself is relatively new, built within the last twenty years. Modular classrooms have been added to make more room as the French Immersion program grew

in the school. This growth resulted from the division's administration decision to bus all students to Beaver Ridge School making it the only school in the division to offer this program.

The program approach used in this study was to have gifted students accelerate through the required course content, then independently research an associated area of interest from the curriculum. They were expected to undertake an in-depth exploration that allowed for construction of knowledge and, finally, to present this information using a multimedia tool of the student's choice. This approach was derived from numerous literature sources (Alberta Learning, 2000, Bulls & Riley, 1997, Riley & Brown, 2001).

Students were given access to the computer lab that contained Macromedia Studio MX, as well as PowerPoint and FrontPage for developing presentations. There was also limited access to video and audio editing software on the teacher's computer in the lab.

For the senior high students involved in the study the Social Studies course was chosen for this research study. For the elementary student research was done in the Language Arts and Social Studies courses.

Chapter 2 - Literature Review

Introduction

Much of the literature in the area of technology and giftedness is composed of suggestions for best practices based upon preexisting knowledge of programming needs for gifted students and theoretical assumptions (Nugent, 2001, Adams & Cross, 2000). Furthermore the bulk of the research in the area of giftedness has tended to be done with extreme samples that have little applicability to this study (Adams & Cross, 2000, Cohen, 1997). Few studies dealt with gifted students in regular classrooms. Most were conducted in conjunction with special non-integrated classes usually at private or magnet schools in which resources, staffing, and curricular considerations are not an issue (Kalchman & Case, 1999, Cohen, 1997). Research within the area of giftedness and multimedia was also sparse (Riley & Brown, 2001) and dated, with the most current research being 1998 with the exception of the Riley and Brown study.

This literature review presents the most recent studies in the area of giftedness and computer technology, especially addressing the theory, methodology and findings. Primary emphasis will be on justifying the rationale for the programming approach to be used in this research study, which is to implement computer technology as a means to challenge gifted students through the development of computer based presentations.

How the Literature Review Was Conducted

An ERIC search of the terms "academically gifted and technology" produced over 200 articles of which only two were empirical research studies performed in this area in the last five years. A search of ProQuest Education Journals using the keywords "gifted and technology" returned 358 articles. Other terms such as "computers", "gifted",

"talented" and "multimedia" were also used but no additional articles were returned. EBSCO Publishing, Expanded Academic ASAP and CBCA Fulltext Education were also searched using the same keywords but all the relevant documents had already been identified in the ERIC or ProQuest search. The searches were reduced by selecting articles more recent than 1994. The year 1994 was chosen because this is shortly after Mosaic was introduced (A Little History of the Web, 2002/11/24) and the Internet became accessible and useable in typical schools. Since computer technology in this study refers to, in part, the use of the Internet for research, it was important to look at studies conducted after Internet became available. Approximately 70 abstracts were reviewed from the reduced lists of which 18 articles were retrieved that were directly pertinent to this research study.

Use of Literature to Establish a Programming Approach

The programming approach used in this study was derived from numerous literature resources. The approach consisted of having gifted students accelerate through the required course content; independently research an associated area of interest from the curriculum in an in-depth exploration that allowed for construction of knowledge; and finally to present this information using a multimedia tool of the student's choice.

Support for using the Internet as a research tool to construct learning is plentiful (Negreni, 2001, Shaffer, 1998, VanTassel-Baska, 1998, Smith & Brydges, 1998, Bulls & Riley, 1997). In these reports the Internet is seen to help prevent the gifted student from being limited in terms of the depth and breadth of information they can access (Negreni, 2001, VanTassel-Baska, 1998, Bulls & Riley, 1997). The Internet also provides information in a variety of formats such as text, audio and video (Bulls & Riley, 1997). In

the growing age of computer technology, knowledge accumulation is often seen as no longer as important as knowledge retrieval and the ability to explore new areas of knowledge will greatly benefit the gifted student (Shaffer, 1998, Smith & Bridges, 1998). The Internet is often the most current source for information (Bulls & Riley, 1997) and is therefore an important research tool.

The idea of compacting the curriculum to allow students in this research study a sufficient opportunity to work with computer technology is based on Johnson's (2000) and Devlin and Browns' (1997) suggestions on how to meet the academic needs of gifted students as well as on interviews with leaders in the field of gifted education (Rizza & Gentry, 2001).

Alberta Learning (2000) states that general curriculum objectives for gifted students should promote student directed learning and be inquiry based and process-orientated. In developing instruction for gifted students the following strategies should be incorporated:

- Differentiation
- Self-directed enrichment projects in passion and strength areas
- Tiered Assignments
- Multiple, varied instructional paths
- Program individualization and extension
- Authentic assessment
- Collaborative evaluation

(Alberta Learning , 2000)

Rizza and Gentry (2001), Nugeni (2001), Johnson (2000), VanTassel-Baska

(1998) and Mann (1994) support this approach, placing an emphasis on self-directed learning and program individualization. Further work done at the Center for Gifted Education at the University of Calgary suggests that individualized programs for gifted students should center upon areas in which students have a natural talent or interest (Smith & Brydges, 1998). This is also recognized by Sally Reis and Carol Tomlinson (cited in Rizza & Gentry, 2001) and Riley and Brown (2001).

The idea of student led, self-directed study using technology seems to have merit as evidenced by the literature just discussed. However, with the limited amount of research done specifically in this area, it was important to consider a framework for the technology use within the study. The framework was derived from Stettler's (1998) work in which she identifies four modes of learning with technology. The modes of learning with technology as termed by Stettler were identified as:

- Acquirer of information – The purpose is mastery of course knowledge and skills in a linear sequential fashion. Students can acquire information from interactive programs in which students must master one skill or knowledge set before moving onto another.
- Retrievers of information – Students search through information to extend core knowledge and skills. Their learning is non-linear in fashion. The World Wide Web is often an important technology based resource from which students retrieve information, as are online encyclopedias like MSN Encarta.
- Constructors of information – Students produce information through extension of core knowledge and skills that often requires higher-level thinking to construct

and produce information. Students can use a program such as Geometer's Sketchpad to produce and test a geometric design for example.

- Presenters of information – The student communicates information that has been constructed and produced by them. Common presentation programs such as PowerPoint or Hypercard can be used to present information, as can HTML editors for developing webpages.

Stettler's classification of learning modes using technology is one I agreed with based upon my own practice as a teaching professional. It was also supported by Wilson (cited in Nugeni, 2001). Stettler's classification then became the basis for the framework for the computer use within the study. Students should pass through these four stages when synthesizing knowledge using technology. However, students' use of technology in projects may appear seamless with no clear-cut start or end to any stage and the students themselves may be unaware of the distinction between categories (Stettler, 1998).

Important to the framework for the programming approach developed for Beaver Ridge School was the proportion of time a student might spend in each mode. Stettler (1998) suggests a program of 60% acquirer, 15% retriever, 15% constructor, and 10% presenter of information for regular students. For the gifted student however she suggests 20% acquirer, 25% retriever, 40% constructor, and 15% presenter of information (Stettler, 1998). This can be compared to the Alberta Learning's guidelines for gifted students suggesting the use of student directed learning that is inquiry based and process-orientated (Alberta Learning, 2000) and also to Johnson's (2000) and Cohen's (1997) studies with gifted student programming.

Bulls and Riley (1997) also recognize computers as an important resource in

meeting the individual needs of gifted students. Based upon special education services information they recommend multimedia development, specifically designing and building webpages as a means to address nine critical areas in gifted programs:

- Personal growth
- Creativity
- Critical thinking
- Forecasting/planning
- Decision making
- Computer skills
- Leadership/organization
- Independent study
- Communication

Bulls and Riley (1997) also identify the planning and construction of webpages as a means to promote critical thinking and challenge the gifted student. Webpage development can require the utilization of visual elements (e.g. graphics, movies) and written communication, as well as audio (e.g. .wav files, mp3 files). This requires planning and organization on the part of the student, which is dependent upon decision-making processes (Bulls & Riley, 1997). Johnson (2000) also suggests that using a computer's various software programs such as spreadsheets and databases and the world wide web to research problems and participate in contests requires higher level skills that enhance problem solving abilities and promote reasoning. Van Tassel- Baska, a leader in the field of gifted education for over 25 years, states that challenging the gifted student includes allowing them to participate in contests and competitions, to branch out in

independent studies in areas in which they have a particular interest and to allow them to develop their own internal sense of excellence. (Olszewski-Kubilius, 2001)

The framework for the computer usage for the program used in this study was to have the students work to achieve an approach of 10% acquirer, 20% retriever, 40% constructor, and 30% presenter of information. The rationale for placing a higher emphasis on presenter of information than that given by Stettler (1998) is premised upon the idea that while constructing knowledge through the use of multimedia tools students will use higher cognitive processes such as problem-solving, synthesis and evaluation. This idea is supported by Ludwig (2001), Riley & Brown (2001), Nugeni (2001), Shaffer (1998) and Bulls & Riley (1997) who advocate the development of multimedia presentations as an effective enhancement tool for gifted students. Nugeni (2001) advocates webpage publishing as a medium for gifted students to demonstrate a particular proficiency or teach a concept. Furthermore by continually updating their webpages gifted students are empowered to control their learning and continually develop and redesign their work (Nugeni, 2001). Shaffer suggests "that gifted students can make the most effective use of computers and related technology by developing research and presentation skills" (Shaffer, 1998 pp. 4). Riley and Brown (2001), suggest that:

> The key point is that the real value of multimedia is not necessarily viewing someone else's efforts, but engaging students in researching, designing and building their own projects. In this regard, multimedia should not be seen as merely a presentation medium. It can provide a means of expression that supports innovative approaches to education, including cooperative learning, thematic problem-solving, and individualized project work. When multimedia is used, students become active learners who are able to develop their own understandings, thus creating and inventing their own knowledge. In other words, multimedia should not be seen as a new way of doing old things, but a new way of doing innovative things even better. (pp. 21)

In addition, Cohen (1997) conducted a study in which students at a new magnet school used a wide variety of multimedia tools, placing more emphasis than suggested by Stettler upon the presenter of information mode. Cohen saw this as possibly an important tool in enhancing achievement of gifted students.

Review of Relevant Empirical Studies

Although the literature supports the hypothesis that gifted student achievement will be improved through the use of technology (Ludwig, 2001, Riley & Brown, 2001, Nugeni, 2001, Adams & Cross 2000, Shaffer, 1998 and Bulls & Riley, 1997) few recent qualitative or quantitative studies have been performed in this area. Kalchman and Case (1999) used an equivalent pretest posttest control group approach to evaluate the achievement of two classes of gifted eighth grade math students in a non-integrated setting. The experimental group used spreadsheets and developed presentations while the traditional group used a text-based approach to instruction. They found overall that the experimental group performed better than the traditional group in the posttest, showed more diversity in answers, and were more confident in their knowledge. Their approach was similar to the one used at Beaver Ridge School in that acceleration through the curriculum occurred first to allow time for students to use computer technology tools to further their understanding in the curricular area and then to present their understanding through the use of a computer based presentation tool. The students in the experimental group became experts in a single area and then taught others in their groups. Similarly, students in this study will become experts in an area and present it to their classmates. In the Kalchman and Cross study, however, cooperative learning opportunities with peers in the same grade were available to students in the experimental group; this was not the case

in the approach used at Beaver Ridge School.

Cohen (1997) followed students at a new magnet school for gifted students, which was trying to use computers as a cognitive tool and multimedia as a means to demonstrate learning. Using observations and interviews Cohen investigated the effect of technology upon learning styles of gifted students. She found mixed results and attributed this to the study being conducted during the first year of operation for this school. Educators did not share common goals and visions and consequently a range of emphasis was placed on the role of technology in the classroom. It may have been premature to conduct a study of this nature during this institute's infancy. In spite of these limitations, Cohen was able to identify the need to continually offer feedback and support to the students as they worked independently. Students were leaving a very structured and monitored environment found in the classroom to proceed to construct knowledge independent of their classmates, which was analogous to the situation for participants in this study.

Research with a grade one class on inquiry learning using computer technology performed by Peck and Hughes (1994) suggested favorable impact upon student thinking skills. This study sought to describe the impact of inquiry learning in a technology rich environment from the perspective of the students, teachers and parents. The researchers cautioned that the improvement seen in their study was in all probability dependent more upon the inquiry approach itself as opposed to the computer technology. Although their observations and interviews were positive they called for more qualitative and quantitative studies to investigate the effect of inquiry learning using technology on the development of advanced cognitive skills.

Considerations for A Programming Approach Based on the Literature Review

Important for this research study is the observation made by Cohen (1997) in which she identifies the need to continually offer feedback and support to the students as they work independently. Students will need to be gradually moved from a teacher-centered to self-directed learning environment. Students are used to a structured classroom environment (Cohen, 1997) and expecting a student to initially be able to work independently without any support may be unrealistic. To accommodate this situation a step-by-step approach was proposed in which initial plans and ideas will be discussed between teacher and student. The classroom teacher would provide initial resources and guidance, and, over the course of the unit withdraw their support in an incremental process until the student is working entirely in a self-directed manner.

Bulls and Riley (1997) caution against some of the pitfalls of using the Internet for research, including determining the credibility of the source. Based on this, students at Beaver Ridge were to be given instruction on how to verify their sources prior to commencing their research. Ideally initial sources will be discussed with their teacher in order to verify that the student is indeed using credible information to developing their understanding in their content area.

Chapter 3 - Methodology

Introduction

This study sought to describe how gifted students using an individualized exploratory learning approach used computer technology in their learning. Students would work independently to research relevant curriculum topics currently being taught in their regular class and then present their findings in a computer based presentation format. Since individual student results were investigated in this study with the impact of the program on each student being uncertain a qualitative study was conducted. The actual program developed for each individual student was loosely based upon Stettler's (1998) modes of learning using technology. Students would work through the four modes of learning (acquirer, retriever, constructor and presenter) with a target of the students proportioning their time allotment to 10% acquirer, 20% retriever, 40% constructor, and 30% presenter of information to place more emphasis upon the constructor and presenter modes of learning.

Since each student had unique interests as well as varying in age and computer ability it was important that the approach taken was specific to the students needs. Alberta Learning (2000), Johnson (2000), Stettler (1998), VanTassel-Baska, (1998) and Bulls and Riley (1997) recognize the need to tailor programming for gifted study. To make these accommodations each student was able to choose the types of Internet tools and the presentation software that best suited their abilities and needs. All students used the Internet as a means of researching their area of interest, however the Internet resources used by each student differed as did their approach to find information. Students also had the choice of the presentation software they used with PowerPoint,

Flash and Dreamweaver ultimately being chosen.

The work on the project spans an entire unit of a course that did not exceed six weeks in length. Pre project interviews and observations occurred no sooner than two weeks prior to commencement on the project and post interview observations and interviews were conducted no later than one week after completion of the project.

Study Design

For this research study a case study approach was utilized. The case study approach was chosen because the goal of the study was to showcase the real-life experiences of these students using the previously described program approach in their natural setting. Since the school in this study is a small rural school, the number of possible participants was expected to be low and access to resources limited. The focus of the study was to allow each of the participants an opportunity for individualized exploratory learning using computer technology. As described by Gall, Borg and Gall (1996) case studies research can be conducted for one of three purposes: to produce detailed descriptions of a phenomenon, evaluate a phenomenon or to develop possible explanations for a phenomenon. This case study's purpose was to provide a detailed and rich description of the experiences of these students and discuss their experiences. Data for the study was collected through observing the students, both in class and during their independent work, and through interviews with both students and their teachers.

Participant Selection

At the time of the study the school population of 440 students had six gifted students identified according to the school division's established guidelines. Three of the six students were selected for this study, all of whom were minors. Selection of students

was based upon students having English as a first language (which excluded two students). The scope of the study was not meant to address the complexities of thinking in multiple languages, which is why these students were excluded. The remaining four were asked to participate and consent from parents, students, and the student's teacher was obtained in three instances.

Permission to conduct the study was obtained from the special education coordinator, the school principal, the division's Director of Special Education, the division's school area Assistant Superintendent and the division's Superintendent.

Data Collection

I was a staff member at the school in which the program was undertaken and the case study conducted; therefore, familiarization with the research site, students and respective teachers had already occurred.

Observations

Initial data was obtained through observation of the students and the work environment in the classroom prior to working on the study. Observation sessions lasted for approximately 30 minutes. These observations were to ascertain the amount of interest the student currently displayed in their school work, the types of activities in which the student was primarily engaged, and the methods the teacher used to motivate the student. Two observations were made while the students worked on their projects, which equated to observing the student approximately 33% of the time they were working. Students worked on these projects for 42 minutes generally once a week for six weeks in a pull out approach. Students also spent additional time after school working on their projects. Field notes were written so that observations were as non-intrusive as

possible to the classroom setting. Notes included descriptive information such as describing the physical setting, how the student was interacting with their environment, their peers, their teachers, and whether they appeared engaged or unengaged. Descriptions of behaviors of the students were described.

Interviews

Students were interviewed four times during the course of the study, and their teachers twice. Student interviews occurred once before work on the project began, twice during the project and once after the project. Teacher interviews occurred once before and once after the completion of the student project. The interviews were conducted in a classroom not belonging to any of the participants. A casual conversation usually occurred prior to the interview to help put the participants at ease. Often we conversed about sports, other events occurring in the school, or what they had done on the weekend. The conversations were brief lasting only a few minutes. The interviews themselves took on average about twenty minutes to complete.

Interviews were semi-structured in nature. One set of questions was used in an interview with each student prior to their project work; a second question set was used in the two interviews during the project and a final set at the end of the project. The goal was to gain perspective on the participants' feelings towards the program approach and whether it was beneficial in meeting their needs. The interviews followed the following procedure:

1. Consent was obtained for the participants (both teachers and students) to be interviewed. In the case of the students both their consent and their parents was obtained. I explained my role in the process as the researcher and assured them of

the confidentially of the contents of the interview. I also explained their role as the interviewee, that they had the right not to answer any questions and not to be interviewed. This was reviewed once at the start of the study with each participant.

2. Participants were contacted prior to the interviews and a time that was mutually agreed upon was arranged for the interview to take place. Participants were informed that their responses would be tape recorded and then transcribed.
3. There was a different set of questions developed for the student and teacher that were used as a starting basis for engaging the interviewee. The questions endeavoured to be as open as possible, often asking the participant to describe their reactions to the experience. The student questions focused on their individual experience through the process and their opinions on technology prior to the start of the research. The teacher questions inquired as to whether there were noticeable changes in the student as a result of the study and described what the students were like and how they worked prior to the commencement of the study.
4. As the interview progressed specific questions based on the given responses were used to determine whether students used critical thinking and planning skills as they worked on their projects. Additional probing questions were employed when necessary in order to draw out information that arouse during the course of the interviews.
5. The interviews were tape recorded and then transcribed.

Data Analysis

The impact of conducting an exploratory learning activity and presenting one's

learning using a multimedia tool was analyzed for each individual student. The data collected was coded based on the themes that emerged and interpreted based on the research question, the purpose of the study and the experiences of the participants.

Once transcribed, interviews were subjected to member checking by the participants to confirm the accuracy and correctness of the transcription and to assist in maintaining validity.

All transcripts from interviews and field notes from observations were coded. The emerging themes from the collected data were categorized pertaining to both student and teacher perceptions of the process, the resulting learning and activities used in the process. The resulting categories from the data analysis were:

- Student Learning
- Student Involvement and Motivation
- Student Planning Process
- Impact of Technology on Student Learning and Student Motivation
- Assessment of the Program

Results from my observations were compared to interview transcripts to help establish research validity.

Ethical Considerations

Participants and their parents were initially informed of the nature of the study either via phone or face to face. The parents of the students eligible for the study were initially contacted by me to have the nature of the study explained to them. No attempt time was made at this time to obtain consent. The intent of the initial conversation was strictly to provide information outlining the nature of the study, the type of data to be

collected, the purpose of the study, expectations of participants and rights of participants. Parents were informed that a permission form would be mailed to them, and they could choose to have their child participate or not participate in the program. They were informed they could opt out at any time without prejudice or consequences. Participation in this study was strictly voluntary and no incentives were used to attract participants. Participants, their parents and their teachers were informed that the research data was to be used for this thesis research, any related academic papers, and also possibly for review by the division's student services team. Participants wishing to opt out could contact me directly or contact their teachers who would inform me of the participant's wish to opt out of the study.

Given that the study was being conducted in a small town, this thesis does not indicate the name of the town, the school district, the school, teachers or students that participated in the study, pseudonyms have been used in all of these instances. No descriptions will be given in the thesis that might allow discovery of the name of the town, school district, school or students who participated in the study. All data shared with the division's student services team did not contain student names or other identifying attributes.

Teachers of the participants were also afforded the same option of opting out of the study at any time and were not given any incentives to participate. Support was offered to the classroom teacher by the special education coordinator to develop a customized program for each gifted student to utilize based on the prescribed format. In two cases the teacher worked with the student, foregoing the support. In the other instance the teacher took the support offered.

The researcher will secure data from the study for a period of five years after completion of the study after which time it will be destroyed.

Limitations and Delimitations

The study did not address individual giftedness as it might apply to aptitudes and particular talents such as musical giftedness or interpersonal giftedness. The study focused solely on those students identified as gifted as per the school division's guidelines. The scope of the study was limited to students in French Immersion or English programs, students identified as gifted in the Slavic Language program were not used for this study since these students are primarily English as a Second Language students and the study was not designed to address the complexities of thinking in multiple languages. The French Immersion students in the study all spoke English as a first language.

The participants in this study are school aged and there is some concern as to the metacognitive awareness. Given this ascertaining how the students learn from the own descriptions might be difficult. Teacher observations and questioning techniques will be used as much as possible to help answer this question.

Since I was a staff member at the school I monitored my perceptions and feelings during the course of the study to ensure, to the extent that I could, that they did not impact the outcome of the study. I was also cognizant of the fact that I had selected the program approach used in this study. I reviewed this at the end of the study I do not feel that I missed relevant observations due to my familiarity with the students and staff or my partiality to the approach used.

Given the relatively small number of available students that met the criteria to

participate in the study, obtaining consent for enough students and their teachers to participate was critical. Although since I was a staff member there was the risk that the participants, their parents and their teachers might have felt obligated to participate in the study, however there was never any evidence of this.

I realized that students might not be consciously aware of differences in how they were processing information, whether they were using problem solving skills or the types of problem skills they were using or their level of engagement in their project. It was particularly difficult to have students reflect upon this aspect, as they all seemed to be lacking metacognitive awareness. Probing questions were continually used to try to help students determine whether they perceived any differences in how they worked on the project. However at times the questions were not answered sufficiently and further questioning would have been leading the students to answer in a certain manner so the line of questioning was not further pursued.

Chapter 4 - Results

Overview of the Participants

Matt, Tom and Nick were all identified gifted students at Beaver Ridge School. All three participants have been attending the school since kindergarten and all had been or were French Immersion students in the school. Coincidentally all students have at least one parent who is also a teacher. The three participants are all males each of whom are actively involved in extracurricular activities.

Matt was a grade three student in French Immersion at the time of study. He comes from a single parent home and has a younger sibling who attends the same school. Overall his IQ scores are the highest of three participants being close to the 140 range as tested using the WISC III. He was in a split grade 3/4 class at the time of study.

Tom and Nick are fraternal twins both in grade 10, with Nick being born ten minutes before Tom. Both boys had overall IQ scores near 125 just meeting the requirements for giftedness. Tom and Nick come from a family of six, five boys plus the youngest, an adopted sister of aboriginal heritage. Their sister and one older brother still attend Beaver Ridge School, their two eldest siblings have graduated and gone onto post-secondary education, one to University to study education the other to college to become a firefighter/paramedic. The following are their stories.

Tom

Introduction to Tom

Tom sits in his class, twirling his pen, like a baton leader for a band, his fingers never still. He lends forward in his desk, his hand rested on his palm intent on the discussion occurring in front of him. He listens for a while and then takes the opportunity

to start shooting a rapid barrage of questions at the teacher, not waiting for answers, intent upon undermining those in front of him, showing his superior knowledge to theirs.

This is Tom; he loves to debate and challenge classmates, friends and teachers. Class to class, day in and day out Tom tries to raise controversial questions and get side tracks to discussions of class content occurring. It follows quite well that Tom wants to be Prime Minister of Canada. When asked where he sees himself in ten years Tom answers without pause, "In ten years I plan on seeing myself as a teacher, because my lifelong goals would be education and politics so in ten years I would still be teaching getting ready for me being Prime Minister of Canada." (Tom, Pre-study interview, 2003)

Tom is a sixteen year old grade 10 student. He comes from a family of six children, of which he is the second youngest. He was in French Immersion until grade 6 (the highest level offered) and then moved into English language courses. His mother is a homemaker and his father an entrepreneur and the high school Chemistry teacher.

There is a rivalry between Tom and his twin brother Nick that is a constant, running deep for years. They compete over marks, girls, friends and sports accomplishments. As soon as a test or assignment is handed back they ask the other how they did, wanting so much to have outdone the other. Despite the rivalry the twins are also the best of friends, always together, always willing to come to the aide of the other, taking the same classes, participating in the same extracurricular activities. Tom tends to be the stronger of the two academically with Nick excelling more in the area of sports and social charm.

A family trait that seems to run through the five boys is a genuine belief in their genetic superiority. They present this belief in a very tongue and check fashion, which is evident in a number of ways.

Despite the high opinion Tom genuinely holds of himself, he is still quite popular at school, part of the nucleus of the grade 10 class. Having been with the same classmates for eleven years, his behaviour is part of his personality and often his classmates and friends take great fun in teasing him when he comes up less then perfect in any endeavour. It is usually all done in good fun with Tom giving many a sarcastic retort.

Tom's Project

Beaver Ridge School is a small K – 12 school there is only one grade 10 class. In the first semester the grade 10's had Language Arts, Math, Science and an option. During the time of the study the grade 10's had Phys.Ed, CALM, CTS and Social Studies. Given that Social Studies was the only core course being offered at the time of the study, the research project was chosen from this area. At the time of the study President Bush and the United States had just invaded Iraq and the war in Iraq was constant front page news. Tom through discussions with his teacher, Bob Grant, decided to develop a website that showed both the Iraqi and American point of views to the war and without introducing Tom's own bias as to whether the war was just or not.

Tom was quite excited about doing a project on the war in Iraq, because in his belief it was a controversial topic, one that lent the opportunity to debate. When asked what he liked best about the project his response was, "I get to help out a teacher that needs us and we can teach other classmates about controversial issues like the war in Iraq

that is one of my favorite subjects because it is highly controversial" (Tom, Post-Study Interview, 2003).

Tom at Work

I enter into the computer lab, a portable attached to the end of school. There are no classes or other students present at the time I come to observe Tom; he is working alone in the lab. Tom has chosen to work in the second last row in the lab using the computer at the end of the row. The lab contains 35 Pentium III computers all on rows of tables, keyboards and mouses are placed in front of the monitors, the towers beside them. Plastic blue chairs are positioned in front of each computer terminal. The walls contain posters with web addresses for career information sites, steps on using a search engine to find information and information on accessing the LearnAlberta website. The teacher's desk is at the front of the room with shelves and cubicles that contain a variety of CTS modules behind it. Windows and a whiteboard behind the desk and above the shelves fill the wall.

This is my first observation of Tom. He is hard at work on his project. Tom raises his head slightly from the computer screen when he hears the door open, nods slightly to acknowledge my presence and returns quickly to the work at hand. I sit a little to the side and behind Tom as to not intrude upon his space as he works, lest my note taking distract him. Tom's nose is literally just inches from the computer screen. He is leaning forward into the screen, sitting at the edge of his seat. His left hand is again rested on his palm, his elbow supported by his knee as he works with his right hand. He is intently working on developing a 3-D banner for his website, playing with the color palette, obviously trying

to achieve a certain effect via the text. He spends nearly ten minutes working with the color, before moving onto adjusting the type of font.

Tom shifts from resting his head on his palm to leaning back on his chair as he works. He does not endeavour to enter into any kind of conversation with me as I am there; he is intent on getting the text just right. He seems to take no mental or physical breaks from his work, for the entire time, the thirty minutes that I observe him he is engrossed on the 3-D text.

I have a chance to interview Tom later in the week and I ask him how he would compare the work he is doing on this project with the work he is currently doing in class:

> The work right now in Social class falls in the same category, the war in Iraq and stuff like that except this way more of our time is actually focused on actually working. In class it is usually like paper work, straight stuff like that, except this gives us a chance to use computers, multimedia, design websites, flash animations and it just gives us a better understanding of our projects. (Tom, During Study Interview #1, 2003)

Tom explains that he likes using the computer because:

> with computers I can sit there and fool around with any tool for like even hours if you want just figuring it out, there are so many things that you can do on a computer that you can't do on paper (Tom, During Study Interview #1, 2003)

I ask Tom about this in more detail, asking him to explain how learning to use tools on the computer is helping him learn more in social studies, Tom replies by saying:

> I don't actually think that the war in Iraq is actually covered in Social other than current events and so on and so forth, but this way I have to actually know what we are writing about so a lot of research is actually done, we look up information like Suddam Hussein's biography, the history of Iraq, causes of the war, things like that. (Tom, During Study Interview #1, 2003)

I am interested in determining whether the students involved in the project approach the planning of these projects differently and also want to get a sense of how the modalities of learning with computers is playing out in each case. I ask Tom if his planning for this project has been the same as how he normally plans out a project or whether he has done anything different:

> There is more organization involved in this project so what I did for starters, was I just, instead of just going and grabbing information as I want along, I did all the research, I found the pictures, I found the songs and made all the word documents, everything all in advance so all I have to do now is kind of cut and paste and like put the words where I want it and design the website, whereas before I would just find something as I go along, but its different. (Tom, During Study Interview #1, 2003)

I asked Tom whether he was essentially culling the information as he went or in some form judging the relevancy of the information to his presentation:

> Yeah what I did was, basically I just looked up key elements that contributed to the war in Iraq, like I would type in cause of the war and see things that would come up. I would read like the first paragraph or so and then I would basically know what it was about and whether it was useful or not and then just take it, sometimes I would get more information the I need so then I would just take it even if it was not relevant so I had back up material. (Tom, During Study Interview #1, 2003)

I had noticed that he seemed to be looking for a certain feel for the website while I observed him earlier in the week working on his text, so I asked him what kinds of things he is considering as he is putting the website together:

> All the time I am trying to keep an overview of the page and how I want it to be, like how each picture will contribute to the thing, like if I come across a picture that is not relevant I'll still take it and use it but I will think of it as a minor part and put it somewhere where it would be most useful. (Tom, During Study Interview #1, 2003)

I enquire further, asking what he likes about presenting his project in a multimedia format versus how he would normally present a project in class. He responds:

> I think when you present in a website you have the class's attention more and you seem more empowered because if you just go up there and do a presentation the class is bored, but if you go up there and you have graphics and you have movies and you have sound then it grabs attention more, they listen to you more. (Tom, During Study Interview #1, 2003)

The next time I visit Tom, Nick is in the computer lab working on his project at the same time. Although they are seated side by side both are working quite independent of the other. There is no conversation occurring, neither is asking the other for help, it is just as if any other student that might be sitting beside him. Aside from the two students, their classmates from their social class are also present, working on a research assignment from Bob Grant. Both Tom and Nick are sitting a little to the side in the back of the room off from their classmates. Tom is typing, adding some textual information to one of his web pages; he has one foot up on the chair beside him while he types. Once he finishes his typing he leans back in his chair, surveying the page, seeming content with the text he moves onto adjusting the colors of the page itself. Tinkering intently after a few minutes he seems satisfied and carries the color scheme forward to other pages he has made. Once again the entire time I observe him he is continually working, not stopping to talk to his brother, any classmates or myself.

I take the opportunity to talk to Tom again after my second observation visit, asking him again to compare the work he is doing on the project versus what he is currently doing in class:

> In class I still have time to fool around, but with this project if I fool around as much as I usually do I won't have time to finish the project on time so I am actually working a lot harder and more conservatively to meet the deadline. (Tom, During Study Interview #2, 2003)

We also revisited how his current planning compared to how he had planned projects in the past. He provided the following insight:

> Now that I have actually developed a system and actually tried it, I find that it works a lot better if you actually organize before you start. So you don't have to take time between the project to fix something or do something like before, so you keep going up instead of going up and down. (Tom, During Study Interview #2, 2003)

I asked him to elaborate a bit more on the system he had developed:

> Basically it is a system, you know I am building a website, so every text and every picture that I am using was already made or found beforehand so I am not wasting anytime while I build the project trying to find a picture that I need or text because it is already all there. (Tom, During Study Interview #2, 2003)

During this second interview Tom expressed concern about the difficulty remaining unbiased while developing the website:

> My big issue or concern is that it might be pointing too much to one conclusion that the war has drawn that it might be that the US was justified or not, or whether we thought it was right or not, it is hard to lean to middle instead of towards one point that you already hold. (Tom, During Study Interview #2, 2003)

I enquired as to whether he thought his bias might have had an impact on his research, but he felt the research just proved his point of view:

> The more research I have found the more it has favored my opinion on whether the War of Iraq was justified, so I think the more I go in the more it is hard for me not to inject my point of view in some part or another. (Tom, During Study Interview #2, 2003)

I wanted to get a sense of what Tom found rewarding and frustrating while working on the project, in describing what he liked Tom stated, "Basically the whole, it is not just individual parts. …it is always the same kind of work and it is really fun. Its lots of things" (Tom, During Study Interview #2, 2003). In terms of what he liked least Tom could not come up with any specific thing, "Um, I still wholly think that everything about it is okay, I haven't found any obstacles" (Tom, During Study Interview #2, 2003).

Tom in the Classroom

I observed Tom in the classroom twice during the course of the study once prior to starting his independent work and then again after the work was completed. The day I chose to observe Tom in the classroom prior to the start of his project was the date of a large ethnic religious holiday. Due to the holiday there were only nine students present in the class and the atmosphere was quite informal. The classroom is another modular one that is quite bright. The classroom has white walls and whiteboards, there are relatively new student desks arranged in six rows of five. As you enter the room the whiteboards are to your left at the front of the room, the teacher's desk is directly ahead at the back of the room and an exit door is at the far end in the back of the room. Above the whiteboards and display boards are painted provincial flags, student work is displayed on the display boards and large posters of Napoleon and John Paul are on one display board behind the teacher's desk.

The student desks face the whiteboard and run in rows next to the teacher's desk, Tom is seated in the last row furthest from the teacher's desk by the exit door, he is in the last desk of the row.

The teacher, Bob Grant has assigned an in-class project today and some students are working in small groups, while others are working alone. As I walk into the class Tom is leaning forward on his desk, his arms crossed, questioning his teacher trying to engage him in a debate. Bob is seated at his desk across the room and says to Tom, "Computer hacker's could get all the money, gold would be worthless" (Tom, Observation Field Notes #1, 2003).

Tom expresses dismay. "Whoa how would you do that?! Get rid of gold, how could it be worthless?" (Tom, Observation Field Notes #1, 2003).

Bob continues to debate the point with Tom, seeming to deliberately state the opposite of Tom's belief, finally Tom ends the debate by stating, "I'll think about it" (Observation Field Notes #1, 2003) as he chews on his pencil still leaning forward in his seat.

Tom appears to then work alone on the assignment, his head bent, writing on the paper in front of him. After a few minutes he starts to discuss the assignment with his brother Nick who is seated two rows away. Nick and Tom enter into a debate this time with a group of classmates seated in front of them, two boys and a girl, discussing whether marijuana should be legalized. Tom listens intently to the conversation, alternating between twirling his pencil and chewing upon it, he is leaning forward making eye contact with each individual member in the group in front of him. He does not state any opinions as Nick discusses the topic with the small group in front of him. The easy debate ends abruptly when Tom starts challenging the group with a barrage of questions, one after the other without waiting for a response. Seemingly exasperatedly the group

returns to their work and Tom gives a small smile and bends down again intent upon his work again.

A few moments later one of the students in front of Tom asks him for a piece of paper. Tom passes one forward to within just an inch, deliberately just out of reach of the other student. This lasts for a few moments, the other student reaching forward and Tom pulling the paper back just out of reach, until finally Tom lets the student obtain the paper.

A classmate enquiries how long the assignment needs to be. Bob Grant responds that "It depends, with all that Tom and Nick want it will be 300 pages long!" (Observation Field Notes #1, 2003), looking at the twins from under his brow. At this Tom stands up in his seat, stretches out his arms in a sort of 'aren't we great' pose and waves to everyone around the classroom. The classmates simply ignore the display and carry on with the work and the act elicits no response from the teacher either. Tom then returns to his assignment.

I come back to visit Tom after he has finished his project. On this date students are giving presentations to their classmates. Tom is seated in his regular seat at the back of the room. He is surrounded by his closest friends in his class, sitting in front of and beside him.

As I walk into the class another student is explaining a cause of a current event. Tom is leaning forward in his desk, arms crossed resting on the edge of his desk, sitting on the edge of his seat. At one point he leans forward and whispers something to his friend in front of him. The friend laughs quietly and Tom smiles then leans back into his seat. He starts to play with his pencil alternating between chewing and twirling it. He

appears to be earnestly listening to the student presentation. The classmate completes his presentation and receives warm applause from all, including Tom, as he leans to his side to say something to the classmate beside him. Bob Grant asks if anyone has any questions for the presenter. A few classmates' hands go up and their questions start to be systematically answered. Tom interrupts to ask question about some obscure point, his hand has not been raised and the presenter has not called upon him. The presenter appears a little flustered and is unable to answer the question. Tom leans back in his seat with a somewhat triumphant smile as the presenter calls upon another student with their hand raised.

Bob calls another student forward to present their topic. Tom again appears quite engrossed in the conversation, occasionally making comments to nearby classmates. Once more the class is asked if they have any questions of the presenter. Tom interjects again with another question on a slightly off topic point that the presenter is unable to answer.

I continue to watch two more presenters and observe Tom during the presentation. The pattern remains mostly the same with Tom intently listening, making the occasional comment and attempting to ask unsolicited questions that the presenters could not answer.

Tom's Final Thoughts

I took the opportunity to meet with Tom once more after he had completed his project to get his final thoughts on the process. I started by asking Tom if he viewed Social Studies any differently now that he had participated in this project:

> I think for me I still kind of view it as the same except that this assignment has given me the chance to actually hope for better

> assignments in the future and it was a lot more interesting then what we do right now, the current events thing is a lot more important than what has been done before but I think about close to the same. (Tom, Post Study Interview, 2003)

I asked him further as to whether his like or dislike of social studies changed as a result of this project, in which case he stated that it had pretty much remained the same.

I was interested in the process and the modalities of learning so I asked Tom to estimate the amount of time he spent gathering information, downloading it, organizing the information and the presenting the information, Tom felt that he had spent 20% of his gathering the information, 10% downloading, 30% of his time deciding how to use the information and the remaining 40% of his time developing his presentation.

I asked him for his final thoughts on his project planning and what he had learned from working on this project:

> I find it is a lot easier not just to work as you go but to organize yourself before it makes your work a lot more efficient. You know what you are doing first before you even start doing it. I will actually start planning my projects better now, so I know what to actually expect and how much time I have to do and stuff like that. (Tom, Post Study Interview, 2003)

It was important for this research to know what Tom found most beneficial and having the most impact upon his learning of the content, the causes of the war in Iraq while doing his project. Tom responded that:

> The greatest would actually be to find the information because you actually have to know what you are looking for and actually know what you are taking from the Internet, so like we kind of did our research on what was going on with the war in Iraq right now. (Tom, During Study Interview #2, 2003)

I was unclear at this point at to whether it was the actually finding of the information or the evaluation of its relevance so I asked him to clarify this point, he stated that in discerning what was useful information.

I asked Tom if he had notice any changes in himself since working on this project, Tom indicated that:

> My perspective has changed in fact that I think higher of myself cuz I was valued with such an important job, I guess you could say that. Basically what you get from the research you understand it better, so you notice a change when you think about the process. (Tom, During Study Interview #2, 2003)

The other aspect to be considered was the impact of the technology itself upon Tom's feelings about the project, Tom felt that using the computer made it a lot more interesting and exciting and stated he would definitely had not been as enthused about doing the project if it had not involved computers.

I enquired as to whether Tom would like to continue with these types of projects in his core classes next year and if so how much time would he like to spend working on them away from the classes. Tom said "maybe like one or two months, it is much better than sitting in the classroom" (Tom, During Study Interview #2, 2003). I clarified that this meant between 20 – 40% of his class time, to which he responded affirmatively.

Finally I wanted to know what Tom would like to do to change the process, he felt that involving more students and giving them the opportunity to work on similar projects and working with groups on these projects would be a worthwhile endeavour to the process.

Tom's Teacher

Bob Grant is Tom's social studies teacher. He teaches all the high school social studies as well as phys.ed courses at Beaver Ridge School. Bob has been teaching for five years the last three at Beaver Ridge School.

I started by asking Bob to explain the ways that he felt that programming could be improved for gifted students in the regular classroom. Bob stated:

> I think that programming can be improved by having smaller classrooms with the more smarter students working together so that they can think beyond what is actually spoken or read to them and also if they had more access to current technology would be beneficial and to have freedom to work away from regular curricular activity just to explore and expand their minds beyond what is normally given for a student of that age. (Bob, Pre Study Interview, 2003)

I asked Bob to explain how he felt computer technology could be used to expand programming for the gifted student, he respond that:

> currently at the pace the world is going with computers I think it is a must that it is provided the computer just offers things that weren't there ten or fifteen years ago and even as much as four or five years ago, so for that to be easily accessible I think is a must for that to be able to get them to think beyond the regular parameters that we see in today's world. (Bob, Pre Study Interview, 2003)

I wanted clarification as to what Bob meant by extending parameters. He felt that both using the computer to conduct research as well as the types of software programs they could provide would help to challenge students to think beyond the context in which they are taught and to question what they learn.

Bob stated that he currently tries to offer a more challenging course for Tom by trying to get him to think beyond just what happened (especially in terms of current events) and to why it happened and what the implications might be for the future. He felt

that Tom was able to meet this challenge in a large part due to what Bob stated as his 'exceptional' problem solving skills, in that he will ask critical questions and also due to his enthusiasm to learn new things.

I enquired as to what types of activities Tom enjoys in class. Bob responded without hesitation, "debates", followed by any type of new activity. Additionally he stated that Tom likes to analyze cause and effect in relation to events. I also asked what activities Tom found frustrating. Bob felt that Tom sometimes becomes flustered when presenting to his classmates, simply because he has so many ideas racing through his mind that he cannot articulate it all.

I meet again with Bob Grant after Tom had completed his project to gain his insights on the process and how Tom responded to it. I started by asking what effect he felt that the independent study program had on Tom's motivation, involvement and learning in Social Studies:

> I think it was pretty good.... I think I maybe gave them (Nick and Tom) one day in class so the amount of actual work that they have done was a lot. So the motivation for them to actually do it on their own time considering it probably took 30 hours to do an assignment like. So I think it had a positive effect on them. (Bob, Post Study Interview, 2003)

Bob further stated that he felt the project was a really eye opener and made Tom more interested in Social Studies.

Bob did not feel that the use computers contributed much to the project in fact he felt a little disappointed. "To tell you the truth I was looking for more new things" (Bob, Post Study Interview, 2003). He felt the research could have been done without the

computers, although it would have been more labour intensive. However he admitted the format of the presentation did require computer use.

I then asked Bob if he had noticed any changes in Tom behaviourally, academically or otherwise as a result of his participation in the project. He responded:

> Yeah, here it is really tough to tell because it is towards the end of the year, and to see a lot of change really did not happen, but at the same time with the amount of work that they actually put into to it to try to actually find the information I think that will have helped them a lot in the future. (Bob, Post Study Interview, 2003)

I asked similar a question about whether Tom appeared to approach new tasks differently since the start of this project and was given a similar answer, due to the timeline of the project and the proximity to the end of the year (this interview happened the second week in June) Bob was unable to state anything definitely.

Bob went on to state that this format had little impact upon his workload and felt it would work well in the area of Social Studies for other gifted students:

> Well, for Social you can give up quite a bit (of instructional time) as long as you have a different project for the other students to work on. Again, because what they (Nick and Tom) got out of it in terms of finding the information and looking at both sides I mean that is invaluable. Its tough to do because when we do a position paper it is usually done at the end of an exam so there is time constraints and the time to find the information they really don't have. So they had the opportunity to really go in-depth with it and it would be very beneficial and a person could allot quite a bit of time, just as any essay or large project because there are so many things that you can do that are curriculum relevant. (Bob, Post Study Interview, 2003)

I concluded the interview by asking Mr. Grant what he would change if the program were to be offered again next year:

> Try and go beyond a little bit more, what effects in the future would something like this have. I tried to get them to go that way but at the

> same time they were doing a lot more facts and they couldn't find facts because they weren't out yet, so if they take something that had happened a little bit earlier in history where you have the repercussions already happen, you could study that and apply that to a current event and see if they could figure what could happen as a result of something happening now or in the process of happening. I tried to emphasis that little bit more with the students. (Bob, Post Study Interview, 2003)

Nick

Introduction to Nick

Nick sits in his desk slouched over his worksheet. One arm is laid across the desk while the other is writing on the sheet in front of him. His head is slightly tilted to the side and he seems to have a plethora of ideas that are spilling out on the paper before him. Others are chatting around him, working on the activity in pairs or small groups however Nick is engrossed in his own thoughts. He looks up for a moment tilts his head back seemingly rolling his eyes back thinking and then returns to a fury of writing. A few minutes later, Nick appears spent of his ideas; he leans back in his desk placing the palms of his hands behind his head and surveys his classmates. Momentarily he affably joins into the discussion occurring with the group in front of him. The group, two boys and a girl seem to welcome him immediately and respond positively to his input.

This is Nick; he is quite popular with his classmates, seemingly getting along with everyone in his grade. Nick can usually be found smiling and laughing. He appears to be a young man that truly enjoys each minute of his life. He is not one to hold a grudge or complain (except in a joking manner). Nick is friendly to staff and students alike, always saying 'hi' and dropping by a teacher's office or classroom just to chat.

In the last year since a Media Arts course has been introduced at the school Nick has shown a passion for video productions. He loves making and editing movies and

recently entered a province wide contest for high school students. Nick's video on bullying, a silent, black and white piece that truly shows the wide impact of the problem placed second overall.

Nick wants to pursue a career in technology and multimedia, focusing in video editing when he graduates. He plans on attending a video production camp in British Columbia for high school students during his summer vacation.

Nick is a sixteen year old grade 10 student and Tom's twin brother. Nick was in French Immersion until grade 6 (the highest level offered) and then moved into English language courses. His mother is a homemaker and his father an entrepreneur and the high school Chemistry teacher.

As mentioned before Tom and Nick are quite competitive with each other. Over the past while as they have matured, Nick's competitiveness with his brother has declined, while Tom still seems driven to outdo his brother every opportunity he gets. Nick being the more socially astute of the two has had a steady girlfriend for the past two years and is more part of the social climate in the school. It is not past Nick to try to use his charm even on the staff members, trying to get out of assignments, to get marks changed, and to plead for extensions on assignments and homework. It seems that a lot of Tom's social acceptance comes from Nick's popularity and his inclusion of his brother. While Tom tends to be the stronger of the two academically, Nick excels more in the area of sports.

Nick appears to be genuinely liked and is a likeable teenage. Friends are important to him and he is quick to defend them in class if issues arise. Having been with the same classmates for eleven years, Nick seems to be an integral part of this group

appearing as though each would be lost without the other. Beaver Ridge School has been Nick's turf for the past eleven years and he feels comfortable and safe in this environment.

Nick's Project

Beaver Ridge School is a small K – 12 school and as such there is only one grade 10 class. In the first semester the grade 10's had Language Arts, Math, Science and an option. During the time of the study the grade 10's had Phys.Ed, CALM, CTS and Social Studies. Given that Social Studies was the only core course being offered at the time of the study, the research project was chosen from this area. At the time of the study President Bush and the United States had just invaded Iraq and the war in Iraq was constant front page news. Nick, through discussions with his teacher Bob Grant, decided to develop a Flash segment that showed the impact of war and asked the question to young men and women in his class: Would you be ready if your country called you?

Nick was quite excited about doing the project on the war in Iraq, because it gave him the opportunity to use Flash and video editing techniques. Nick had learned how to use Flash in his Media Arts course and was planning to bring a lot of video segments of the war into the Flash movie.

Nick at Work

Nick is working in the high school computer lab, a portable attached to the end of building. There are no classes or other students present at the time I come to observe Nick; he is working alone in the lab. Nick has chosen to work in the middle of a middle row. The lab as described in Tom's case study is composed of 35 Pentium III computers

all on rows of tables, keyboards and mouses are placed in front of the monitors, the towers beside them.

Nick is working on his Flash production when I come into the room. His head is one hand slightly tilted looking at the screen, his elbow supported by his knee. Nick is fading out text, gray gothic looking text on a black screen asking provoking questions designed to make his classmates uncomfortable with the safe and tranquil life of general opulence they live here. "Are you ready?", "When the call comes… how will you answer?", "Would you die for your country?". These are the types of messages Nick is placing into the presentation, questions seemingly meant to provoke his classmates and make them uneasy. Nick works on the text for at least three or four minutes and then puts on a set of headphones. He replays the piece with text fading in and out on the black screen, sounds of machine guns and war themed music playing in the background, images of death and destruction appearing between the questions. I sit at the end of the row observing Nick from the side. He seems oblivious to my presence and works concertedly on the provoking piece.

After about ten minutes a class enters the lab and quickly the room is full of junior high students, chatting and working on a research project. As the first students enter the room Nick looks up to see which class has arrived, he returns to the work at hand making no acknowledgements to the students that have just entered. Nick continues to work on the visual impact of the text despite the constant chatter of the group now working in the lab. His attention is drawn away when another student from the class that has just entered asks Nick for his assistance. Nick leans over, observes the other students screen, quickly gives him the advice he is seeking and returns to his project. Nick continues to work

tweaking and checking, taking on and off the headphones and replaying the pieces. He is asked again once more for help, quickly gives the necessary assistance and returns again to his project.

I have a chance to interview Nick later in the week about his work on the project and ask him how he would compare the work he is doing on this project with the work he is currently doing in class:

> The work I am currently doing in social class is lots of notes and copying stuff from the textbook, but with this project I get to go on the computer, which is what I like and actually get to research and make a multimedia production about the war on Iraq. So it is pretty much a more visual way for me to learn, so it is good in that aspect. I think this way is definitely more beneficial because I get to work on it for a long time and it is more interesting and fun. Usually if it is boring I don't pay attention so it's a lot better for me (Nick, During Study Interview #1, 2003).

I have been trying to discern whether the students involved in the project approach the planning of these projects differently and also want to get a sense of how the modalities of learning with computers is playing out in each case. I asked Nick whether his planning for this project has been the same as how he normally plans out a project or whether he has done anything different. "It is pretty much the same because I pretty much get into them and build them as I go, so I got some pictures and I got some video and started making it so..." (Nick, During Study Interview #1, 2003). I asked Nick whether there were certain videos or pictures he was looking for or certain pieces he wanted to use. "Actually I was looking for some specific stuff, I was looking for all of George Bush's speeches on national television and I was looking for the same sound clips so I could copy and paste over the pictures" (Nick, During Study Interview #1, 2003). I point out that he must have had some kind of plan in his head then. Nick laughingly

responds, "I guess so" (Nick, During Study Interview #1, 2003), in a manner that suggests the recognition of the idea. Since it seemed that there was some plan, although informal I asked Nick to explain what he had thought out prior to starting on the project:

> Before I started the project I knew how I wanted to start it off, I wanted lightening and to make it big and bad you know, then I kind of wanted to ease it down and slow it down a bit, throw in some nice pictures then I wanted to build it back up so that it had a more dramatic effect on the audience. (Nick, During Study Interview #1, 2003).

I inquired whether Nick has done similar planning for previous multimedia projects he had made for other classes. Nick explained that this is a unique idea that he had had for a while and he had been waiting for an appropriate time to utilize the framework.

Nick told me that what he enjoyed the most about the project is the freedom it affords:

> The thing I like most about working on this project we are allowed to make um, we have our own timeline and so we can pretty much go at our pace and we have no guidelines so we can pretty much make it how we want to make it the web page and stuff. (Nick, During Study Interview #1, 2003).

The next time I visit Nick, Tom is also working in the lab. Although they are seated side by side both are working quite independent of the other. There is no conversation occurring, neither is asking the other for help, it is just like any other student might be sitting beside him. Aside from the two students, their classmates from their social class are also present, working on a research assignment from Bob Grant. Both Tom and Nick are sitting a little to the side in the back of the room off from their classmates. As soon as I walk into the lab, Nick immediately and enthusiastically calls

me over wanting to show me what he had accomplished. Nick is obviously proud of his work and wants to share it. He shows me what he has done so for, the ominous text pressing its message in a seemingly subtle yet strong way and the pictures, visions of the devastation caused by war, the meaning undeniable. I compliment Nick on his visually effective project and take a seat a little to the side and behind of the twins.

Nick is tweaking the movie, he is playing the piece again, listening with the headphones and tweaking, playing and tweaking, simply making small almost unnoticeable changes and checking and rechecking the segment. His head again is on his elbow, which rests upon the edge of the chair. He sits at the edge of his seat the elbow between his knees leaning into the screen. He is intent on his editing. Aside from his earlier excitement of sharing his work he ignores all that are around, the classmates, his brother, his teacher and I. He stays focused on his task for the entire twenty minutes I observe him.

I take the opportunity to talk to Nick again after my second observation visit, asking him again to compare the work he is doing on the project versus what he is currently doing in class:

> Right now I am pretty much really in depth. I am really enjoying myself. I think it is a great way for me to learn and I am, it is a lot better than what we are doing in social class we are just doing worksheets and it is really not that great. This way we are actually researching we are doing stuff, it is a lot more interesting and fun. (Nick, During Study Interview #2, 2003).

Nick reiterates that he really did not do any formal mapping for this project when asked about the planning process:

> How I did this project was I didn't really start to plan I just did something and then I thought of something else and I pretty much went

> in a line like that. For other projects it is pretty much the same I don't really plan nothing I just go with the flow. (Nick, During Study Interview #2, 2003).

Nick states that he is looking forward to finishing the project, he is excited about how 'cool' it will be when it is done. He says "I think they (his classmates) are going to think it is pretty cool, because a couple of my classmates already saw it and they thought it was pretty cool so I am hoping that everyone follows suit" (Nick, During Study Interview #2, 2003). I wanted to know what he had learned so far besides developing a presentation that he thought was 'cool':

> This is helping me in my social studies because I am a much better learner visually I get to actually see stuff. In social all we do is read and do worksheets, but this way I am able to portray it in a fun way which is helping me learn it so I learn a lot more. (Nick, During Study Interview #2, 2003).

I wanted to get a sense of what Nick found rewarding and frustrating while working on the project. In describing what he liked Nick stated:

> What I like the most about this project is that it is a great way for me to express my opinions and views through a Flash animation thing, it is something I really like to do and it is fun. There is nothing I don't like. It is all good, yeah. (Nick, During Study Interview #2, 2003).

Nick in the Classroom

I observed Nick in the classroom twice during the course of the study once prior to starting his independent work and then again after the work was completed. The day I chose to observe Nick in the classroom prior to the start of his project was the same time I observed his brother and was a date of a large ethnic religious holiday, so the class is

small. The classroom as previously described is another modular classroom that is quite bright with white walls, whiteboards and social studies related posters.

The student desks face the whiteboard and run in rows next to the teacher's desk, Nick is seated in the last seat in the middle row. The teacher has assigned an in-class project today and some students are working in small groups, while others are working alone. Nick is one that is working alone, one arm strewn across his desk as he writes on his worksheet with the other. It does not appear that Nick is simply filling in the blanks but is writing a significant number of his thoughts and ideas. He pays no attention to the others around him engrossed in small discussions about the work. He briefly pauses, looks up thoughtfully and returns to writing. After about five minutes Nick completes the worksheet. He leans back and smiles, apparently satisfied either at being done or at the ideas he has offered in print.

Nick soon joins the group in front of him. In an easy manner he enters the conversation, the group content to have his input. He is quickly into the center of the discussion his comments well received and accepted.

I come back to visit Nick after he has finished his project. On this date students are giving presentations to their classmates. Nick is seated in his regular seat in the middle row at the back of the room. Beside and in front of him are classmates that Nick generally associates with on a regular basis.

At this time another student is explaining a cause of a current event. Nick is leaning back in his seat, listening to the student's interpretation of the event being discussed. Nick looks involved in listening to what is being said, his brother to his left whispers something to his friend in front of him, Nick ignores the interaction remaining

focused on the student at the front of the room. The classmate completes his presentation and receives a warm applause from all including Nick. Bob Grant asks anyone if they have any questions for the presenter. A few classmates hands go up and their question start to be systematically answered. Nick watches the events still leaning back in his seat rocking back and forth on his rear two legs of his chair.

Bob calls another student forward to present their topic and Nick remains intrigued in the presentation. Once more the class is asked if they have any questions of the presenter. Nick simply watches the interaction of classmates asking and responding to each others' questions but not participating himself.

I continue to watch two more presenters and observe Nick during the presentation. He remains the same throughout, for the most part focused upon what the presenters have to say. He asks no questions and offers no comments but appears to have absorbed all that was discussed.

Nick's Final Thoughts

I took the opportunity to meet with Nick once more after he had completed his project to get his final thoughts on the process. I started by asking Nick if he viewed Social Studies any differently now that he had participated in this project:

> My opinions have definitely changed about social studies because before it was all textbook work and that stuff was all boring, but since we did this the war on Iraq thing and multimedia it is really cool. It definitely made the class a lot funner and it made it easier for me to learn so. (Nick, Post Study Interview, 2003).

As with the other cases I was interested in the process and the modalities of learning so I asked Nick to estimate the amount of time he spent gathering information, downloading it, organizing the information and the presenting the information, Nick felt

that he had spent 7 to 8% of his time gathering the information, 5% downloading, 12% of his time deciding how to use the information and the remaining 75% of his time developing his presentation.

I asked him for his final thoughts on his project planning and what he had learned from working on this project:

> For this project I didn't really plan the project I just kind of threw it all together in my head and I kept changing stuff. For the future I would probably do the same I don't really like to plan projects and stuff because I like to have fun and I can do it just as good in my head (Nick, Post Study Interview, 2003).

I asked him to consider all the time he spent reorganizing the information, the bulk of the 75% of the time spent in developing his presentation, would he still use the same process. "Yeah" he replied quite matter of factly, "I don't like to plan that much in advance so it (planning) wouldn't have helped anyway" (Nick, Post Study Interview, 2003). I asked Nick to explain what he thought helped him the most in terms of his learning, "Well, learning the most about Iraq was actually when I presented it and seeing it all together and seeing Tom's website"(Nick, Post Study Interview, 2003). I asked him to clarify what in the process of making the project helped him the most, "Probably surfing the net, I learned a lot from those sources" (Nick, Post Study Interview, 2003).

When I asked Nick if he had notice any changes in himself or his attitudes since working on this project, he indicated:

> Oh yeah, this was definitely very fun and it made me see how much fun social stuff can be like recent events and stuff, because I had a lot of fun doing it and it was a nice break from my regular school work. Definitely changed me lots. (Nick, Post Study Interview, 2003).

He went on to indicate that the participation in the project has left him with a more positive outlook on school.

Nick was asked whether he would like to continue with these types of projects in his core classes next year and if so how much time would he like to spend working on them away from the classes. Nick said:

> I would definitely want to do it, but I would want to do it during the class. Like this I didn't do any of it in Mr. Grant's class. I did it all during CTS class, if it was actually in class I would say it would be a lot funner. (Nick, Post Study Interview, 2003).

Nick went on to state that he would like to spend 60 – 70% of his time working in this fashion.

Finally I wanted to know what Nick would like to do to change the process, he felt that he had more than adequate time to do the project so the time length could be shortened.

Nick's Teacher

Bob Grant is Nick and Tom's social studies teacher. Since Bob was also interviewed for Tom's case study I will only provide the responses that are unique to Nick and allow the reader to refer to Tom's case study for the generally responses to areas such as his opinions on gifted students, how he provides programming and his opinion of the project.

Specifically, I enquired as to what types of activities Nick enjoys in class, to which Bob responded that Nick liked any type of new activity. Additionally, he stated that Nick like his brother enjoys analyzing cause and effect in relation to events. I also

asked what activities Nick found frustrating. Bob stated that it is difficult sometimes for him to get all his ideas across and that can be frustrating for him.

I asked Bob to comment on Nick's motivation, involvement and learning in Social Studies after the study. "I think it was pretty good… I think it had a positive effect on him" (Bob, Post Study Interview, 2003). Bob further stated that he felt the project really made Nick more interested in Social Studies. Tom's interest has always been there since he strives for a future in politics, but there was a definite noticeable increase in Nick's interest in social studies.

As Bob stated in Tom's case study he was a little disappointed with the contribution that computers had to the project. "To tell you the truth I was looking for more new things" he responded (Bob, Post Study Interview, 2003). He felt the research could have been done without the computers, although it would have been more labor intensive, the multimedia format of the presentation, he admitted, did require computer use.

I then asked Bob if he had noticed any changes in Nick behaviourally, academically or otherwise as a result of his participation in the project. Bob responded that again because of the closeness to the end of the year this was tough to discern due to the timeline. He did comment though that Nick's interests had definitely been piqued.

When asked whether Nick appeared to approach new tasks differently since the start of this project Bob gave a similar answer; due to the timeline of the project and the closeness to the end of the year (this interview happened the second week in June) Bob was unable to state anything definitely.

Asking Bob what he would change if the program were to be offered again next year concluded the interview. He responded with:

> Try and go beyond a little bit more, what effects in the future would something like this have. I tried to get them to go that way but at the same time they were doing a lot more facts and they couldn't find facts because they weren't out yet, so if they take something that had happened a little bit earlier in history where you have the repercussions already happen, you could study that and apply that to a current event and see if they could figure what could happen as a result of something happening now or in the process of happening. I tried to emphasis that little bit more with the students. (Bob, Post Study Interview, 2003).

Matt

Introduction to Matt

Matt sits in the middle row on the far right hand side of his class, intently listening to the instructions that Isabelle Leroux is giving for their math worksheet. He appears to be extremely focused upon what is being stated by his teacher at the front of the room, oblivious to the whispering of two classmates in front of him. Madam Leroux concludes giving the directions and Matt immediately immerses himself in his work. He appears to work at a steady yet careful pace, seemingly wanting to ensure that his work is all correct. Occasionally he pauses and appears to ponder as he gazes in the far off distance and then returns to the task at hand.

Meet Matt, a serious little boy who seems to almost be a perfectionist when considering matters of academics. He is very intense and thoughtful for a child of his age, which is nine at the time of the study. Matt is an honor student, yet despite his earnestness in his studies Matt like all young boys his age dreams of one day being an NHL hockey player. "Yeah, playing in the NHL that is what I want to do" (Matt, Pre

Study Interview, 2003), replies Matt when asked where he sees himself ten years after he graduates.

Matt is in third grade at the time of the study. He is in a split grade 3/4 French Immersion class and has been in French Immersion since kindergarten. Isabelle Leroux, Matt's current homeroom teacher, was also his grade 2 and grade 1 teacher. Matt has a younger brother who is in the French Immersion grade 1 class at Beaver Ridge. Matt's parents recently divorced and he is adjusting to his Dad living in Edmonton while he lives with his mom and brother in the rural community where his mother is originally from. Matt's mother is a teacher and his father works odd jobs where he can find them. From teaching ESL to immigrants, to working the oil rigs, Matt's father has had a diverse career. Matt has also recently learned that his father has a terminal condition and he has been given five years to live. There have been numerous adjustments for Matt to make over the past while.

Although Matt is sociable with his classmates and even takes a leadership role in phys ed. and at recess time, there is also an obvious aloofness to him. Growing up in a small town and attending Beaver Ridge School for the last two years Matt knows all of his classmates, yet he has only one or two close friends. When asking Isabelle what Matt finds frustrating in class she indicates group work. Matt has little patience for those who are not at his level academically and finds it particularly challenging if the students he is paired with do not understand the assignment or the instructions. This too seems to carry over to his peer relationships, a polite friendliness with most and only closeness to those he feels somewhat akin to.

Matt's Projects

Beaver Ridge School is a small K – 12 school, with French Immersion being offered in split grades until grade 6. Matt is in grade 3. At this level the expectation is for short assignments, at the very most, two weeks in duration, otherwise the students will lose interest. Given the smaller assignment expectations Matt had the opportunity to complete two projects during the course of the study.

The first was done in the area of Social Studies, the class was learning about the NorthWest Territories and Matt was quite fascinated by Inushuks. This was a topic he really wanted to learn more about, so Matt decided to develop a PowerPoint presentation on the history of the Inushuks, their significance, how they are built and the different types that exist. Matt developed an outline of the project with the help of his teacher and his mother (a high school Language Arts teacher) and spent two weeks on this project.

The second project Matt worked on was in the area of English Language Arts. In grade 3 the French Immersion students are first exposed to English Language Arts. As a fun way of having the students read, they study comic books. Matt is fascinated by Spiderman and decides to develop a website around this superhero. Having gone through the outline process for the Inushuk project Matt develops his own outline for the Spiderman website, covering the story of Spiderman, how he became a superhero, his enemies and an explanation of his superhero powers.

Prior to starting on these projects Matt has worked with PowerPoint but has no previous experience with a web page editor.

Matt at Work

Matt is only in grade 3 and there are no aides available to take him out of class to work on his project. So I take him to the computer lab and observe him while he works. We go to the high school computer lab which is a portable classroom attached to the end of the school.

The room is empty at this time of day, there are no classes scheduled to be in the lab for this period. Matt has the outline he worked on with this teacher and mother and has a computer disk with him. He has found pictures of Inushuks for his presentation at home over the last few evenings.

Matt needs no assistance as he turns on the computer and starts searching using the Google search engine to find information for his presentation. Matt works intently scanning pages of information, although he is in French Immersion he has no apparent difficulty reading in English. Matt seems to scan the entire web page before making a decision as to whether the information is pertinent or not. When he finds one he is satisfied with he sends the document to the lab printer.

Matt works continually for the entire 42-minute time frame. He never once asks a question, he simply leans into the screen reading, critiquing and printing the information. After the period is over I return Matt to his homeroom for Math, he has just missed phys. Ed, but offers no complaints.

The next week I follow the same routine picking Matt up for a 42-minute period and taking him to the high school computer lab. I situate myself about three seats away. Matt again has a computer disk with him as well as numerous papers. Matt's disk contains the beginning of his PowerPoint presentation, he has made a title page, has

developed a background from one of his Inushuk pictures and has chosen a template for his pictures. The papers, it turns out, contain the information he had found in his previous research session. Matt has taken the information and written it out in his own words, he has it organized under headings that match his outline. He is ready to simply type the information into his presentation. He obviously has spent a lot of time working on the project at home. Matt opens the presentation and begins to fill in the text boxes with the necessary information. A title, picture and textbox are found on each page. The background is an Inushuk that has been grayscaled and the text is set in navy. Matt types the information in for the entire 42-minute period. Despite his age he has good keyboarding skills, using a 10 key approach and does not appear to find the task laborious.

I return Matt to his class. He stops me at his locker on the way and shows me the Inushuk he built at home. He explains how he and his mom looked for smoothed rocks on the lakeshore. He expresses how he wanted to ensure they matched in colors and shape and he polished them at home for hours. The Inushuk is a work of art in itself and Matt is quite proud of it, he plans on showing it to the class when he presents his PowerPoint show later this week.

I have a chance to interview Matt later in the week about his work on the project and asked him how he would compare the work he is doing on this project with the work he is currently doing in class. He states:

> we don't do much computers in class, we usually don't get to use computers, we have a computer class but we don't use it as much in French and we just play with it, we don't type as much in class too, when we do have computers I usually don't type as much. (Matt, During Study Interview #1, 2003)

Further he went on to talk about the differences in planning his project:

> Well it is kind of different doing it like this way because I am doing the planning, deciding what to put in and stuff. We can do that too in the other class but we usually kind of have to have certain things that the teacher says we have to have. (Matt, During Study Interview #1, 2003)

We further discuss Matt's planning process. At this point he has already developed an outline for his second project, the Spiderman website. Matt explains that in class his teacher usually provides them with an outline to work with. In these projects he helped developed the outline for the first project and developed the second outline all on his own. He says:

> we don't usually plan projects, like we have, like the teacher tells us what we have to have if they are like PowerPoint and then just do the stuff she tells us. The teacher gives us pieces of paper that tell us how to set it up (Matt, During Study Interview #1, 2003)

I ask Matt which he prefers the freedom to chose the structure of the assignment or having the outline provided, Matt states:

> well sometimes I think maybe if I didn't have some of the ideas I won't know what to do and I won't have nothing, but um so it would I think it is bit easier with them making the choice. (Matt During Study Interview #1, 2003)

"So, it is easier when your teacher makes the plan for you but which do you like better to do?" I enquire (Matt, During Study Interview #1, 2003). Matt responds:

> I like making my own plan because I can put what I want, but sometimes I don't know what and sometimes she will tell us what to do and I like it when she tells us, that what I am going to do and maybe she can help. (Matt, During Study Interview #1, 2003)

Matt has moved onto his Spiderman project. He has previously gotten a quick overview of Dreamweaver, the web editor used in the high school computer lab. He has been shown how to make a table, insert pictures, make links, and change font style and color. Once again Matt is prepared having done the bulk of the research for his project at home. He explains that he wants to use as much of the school time as possible to work on the website itself since the family computer does not have a web editor.

Matt is excited about making a website, something he has never done before. "I like making the site because I never made a site before, so I can't wait until I am done so I can load it on the Internet" (Matt, During Study Interview #2, 2003). Matt spends a lot of this session tinkering with the look of the website. He is glued to the computer screen, sitting on the edge of his seat, literally inches from the computer screen. I sit two seats over and back simply observing him as he works. He starts by playing with the layout of the page. He makes a simple 2 row by 2 column table. In the top right cell Matt inserts a title for his page Spiderman – Superhero. He places an image that he has saved on the computer disk into the cell below the table and starts typing the text he has ready with him. Matt is making an introduction page explaining what the site will contain. Once he completes typing the text in a royal blue, he adds a background image to the page. He starts a new page, inserting the same background image and using the same 4-cell table. At the end of the 42-minute period Matt has completed 3 pages of his website. He has remembered his quick lesson on Dreamweaver well, not once asking for assistance.

We sit down once more for an interview after his work session and I ask Matt what he is thinking about as he works on his Spiderman site. Matt explains that he thinks about:

> the stuff I am typing and mostly just the site and the work, just the different things, like I like getting the pictures for it that is my favorite part of that, pasting in the pictures and stuff and maybe thinking about doing the other things like changing the background and the colors and stuff. (Matt, During Study Interview #2, 2003)

I take the opportunity to ask Matt about the planning and comparing what he would be doing in class at this time with what he is doing now. Matt is missing gym to work on the project, so there is no direct comparison for him. I ask him which he would prefer to be doing, working on the project or being in gym. Matt responds diplomatically:

> I like to be in gym, but I like this but if it could be health instead of gym I would be a little happier, but I like doing this too. So we have two gym periods a week so I don't miss gym altogether. (Matt, During Study Interview #2, 2003)

We go on to discuss the planning process Matt used in this project. He explains that this experience has been a little different for him:

> Well it is kind of different doing it like this way because I am doing the planning, deciding what to put in and stuff. We can do that too, but we usually have to have certain things that teacher says we have to have. But we get to like choose the things we get to have. (Matt, During Study Interview #1, 2003)

I ask Matt if there is anything he does not like doing for the project, without hesitation Matt states the typing. "I don't like typing so much, I think it is a good idea to type some of the stuff at home so when I am here working on it I don't have time for typing" (Matt, During Study Interview #1, 2003).

Matt in the Classroom

I observed Matt in the classroom twice during the course of the study once prior to starting his independent work and then again after the work was completed. The day I

chose to observe Matt the class is having a science lesson on light. The teacher has taken the class to the amphitheater, a large room with a stage and five levels of setting that the school uses for concerts and plays. The room is shaped in a large arc with the stage at the front and the elevated platforms of seating (which are really long expansive carpeted wide steps) surrounding the stage in a semicircle. The lights, theater lightening, have been dimmed as the teacher demonstrates the lab that the students are to perform. The class is seated mostly in the middle of the room on the first two levels of seating. Isabelle LeRoux is working on the floor between the seating area and the stage. The students have assembled themselves in small groups of three or four, sitting together in clusters listening to their teacher. Matt, however, is sitting by himself off to the left hand side of the room and two rows above his classmates. He is listening to the teacher's explanation of the lab and answers a question that the teacher has posed to the class without being asked. The teacher asks a series of questions in regards to the demonstration she is giving, to clarify the class' understanding of the instructions, Matt listens to this with apparent care but offers no other answers to the questions and asked no questions himself.

Once Isabelle Leroux has finished the demonstration the students start to work in the informal groups of three and four. Matt immediately sought out one student in the room for the activity, a boy that is a close friend. Matt and the other student set to work on the task with little discussion. Matt directs most of the activity, interjecting when he feels that something needs to be done or changed in the experiment. Aside from mentioning the work at hand little discussion occurs while Matt and his partner perform the experiment, they continue to work carefully on the assignment, Matt appearing to be

intent on achieving the correct outcome. They take the full twenty minutes given for the experiment to be completed, at which time they are given a worksheet to complete based on what they had just been working on. Matt remains where he was working beside his friend as he begins completing the worksheet. He appears pensive at times while working often stroking his chin and staring off into the distance and then returning to the worksheet to write something down. There is no attempt during this time to engage his friend or anyone else in a discussion, Matt simply works, pondering occasionally with the described pensive expression and returning head down to his sheet.

While I am observing Matt from the top row of the amphitheater his teacher approaches me. She has concerns that Matt seems to be withdrawing from the group, which is evidenced today by his sitting to the side and away from the class during the demonstration of the activity. She is not sure what has caused the dissociation and wonders if there has been some kind of disagreement between him and his peer group.

I come back to view Matt in the classroom after he has finished his projects. On this day the class is doing a group activity. The task assigned is to perform a brief skit to demonstrate the meaning of a French expression such as "strong as a horse".

The groups have already been formed prior to start of the observation. Some of the students are kneeling and others are sitting on chairs that have been drawn in a semi circle at the front of the room. Matt is kneeling to the side of the group. Once Isabelle Leroux has finished given the instructions Matt moves into his group consisting of three other boys, all shorter in height than Matt by at least four inches, and two girls. Matt immediately assumes the leadership role in the group by quickly and enthusiastically putting forth his ideas to the group. The group follows Matt lead with no apparent

resistance, no other suggestions are offered and with some input by others on Matt's ideas the group has decided upon its skit.

The class is called back to order and the students watch as the groups put on their skits. Matt watches the performances from the side of the group. He is not distracted by others around him; he laughs at a humorous moment in one play and makes a comment to boy sitting next to him. Matt's group is now ready to present, Matt and one of the boys from his group that had little to say during the discussion of the skit, get up to perform their interpretation for their classmates. Matt uses tone and expressive language to play act an arm wrestling match, most of the class is laughing as they watch the two perform the skit. They finish the skit and Matt returns to where he had been sitting. Isabelle gives Matt and his classmate positive praise and in response Matt shakes the co-performer's hand in recognition of a job well done.

The exercise resumes with new expressions given for the group to work on such as

- "etre bien excite"
- "etre fou comme un balai"

The teacher has requested that different individuals from the group perform the next skits. Matt sits back as the group discusses how to best represent these pieces. He contributes nothing, simply sitting to the back of the group watching while also observing what the others were doing around him. Although Matt has not contributed to the groups ideas he voices displeasure to the teacher when she states that time is up stating "but we are not finished" (Matt, Field Observation Notes #1, 2003).

Matt simply watches the groups as they perform, staying to the side of his classmates, politely observing not commenting or talking to any of his peers. Once the performances are complete he returns to his desk.

Matt's Final Thoughts

I met with Matt once more shortly after he had completed his second project to get his final thoughts on the process. I started by asking Matt if he viewed Social Studies and Language Arts any differently now that he had participated in these projects. He indicated that he did not, that everything was pretty much the same for him.

I inquired about the process and the modalities of learning, first asking Matt to estimate the amount of time he spent gathering information, downloading it, organizing the information and the presenting the information, Matt felt that he had spent 10% of his gathering the information, 10% downloading, 15% of his time deciding how to use the information and the remaining 55% of his time developing his presentations.

I asked Matt to explain his thoughts on his project planning and what he had learned from working on this project. For his two projects he had developed an outline first with his teacher's and his mother's assistance and then the second one on his own. Despite having developed his own outlines, Matt did not believe he did anything differently in terms of planning for these projects then what he normally did for other projects.

Matt stated that he found finding the information and reading through helped him learn the most. "I think finding the information, yeah reading through it is the part that helped me I got to read the stuff and learn" (Matt, Post Study Interview, 2003). I asked whether he was consciously making decisions about the information and how he was

going to use it as he was reading it at which he indicated he was and that "it helped me because there were some of the same things" (Matt, Post Study Interview, 2003) and he had to select what he used and did not use.

I asked Matt if he had noticed any changes in him since working on these projects, Matt indicated that, "it was pretty much the same" (Matt, Post Study Interview, 2003). There were no noticeable differences to him.

I enquired as to whether Matt would like to work on more of these types of projects next year. He responded yes, "because it makes it interesting and, like, I learned a new thing like how to use a website and its interesting and I get to research and stuff, I like research" (Matt, Post Study Interview, 2003). When asked the amount of time would he like to spend working on them away from his other classes, Matt indicated that "I think about the same as I did this year, so one period a week" (Matt, Post Study Interview, 2003).

Finally I asked Matt what he would like to do to change the process, "um I like it not to be during my gym period" (Matt, Post Study Interview, 2003) he replied with a smile. I asked which period he thought would be better for him and he indicated that computer time would work much better for him.

Matt's Teacher

Isabelle Leroux is Matt's homeroom teacher. She has a split grade 3/4 French Immersion class in which she teaches all the core courses. She was been a previous recipient of the school division's teacher of the year award, always using an inquiry based hands on approach to learning, her lessons are fun, engaging and dynamic for her students.

I started by asking Isabelle to explain the ways that she is accommodating Matt's giftedness currently in the programming she is offering. Isabelle's first language is French. She starts by stating that she might need help with translating a few of the words and expressions into English. She is a little nervous about being interviewed in English but she explained:

> Well for Matt in my classroom it's really neat to have him around because he needs that challenge and the challenge that he has right now since he is in French Immersion is the language he is following well in class. He needed that challenge. The second language is his challenge. It's going to be the same challenge for a few more years but the way he is functioning in the classroom I think he is really comfortable in the classroom. He does not have much time on his hands saying I don't know what to, I'm done my work, because often I see the children who are done their paper sitting there. Okay I'm done my paper now give me some more. I teach in a way that everybody can do their work to their level I have a split grade I have a grade three and a grade four so sometimes my grade three's do a better job then my grade four's because they have a chance to develop their work at their level. So having a gifted one in my classroom, he is really comfortable and he doesn't have much time on his hands to do nothing or to start a new project, you know. I give them something to do, whatever, a research project or a project and they some of them are done and they start another one but it is always pushed to their level. I could have a grade two and a grade five to handle at the same time and I don't think I would have a problem to handle there to develop their work as their own. (Isabelle, Pre Study Interview, 2003).

Isabelle went on to explain how she feels computer technology could be used to expand programming for the gifted student:

> we need technology because right now it is not happening and the kids are not fulfilling especially the ones that are gifted and we would really like to push that knowledge in technology right now some of the kids right now know more than the teachers so it would be really important. (Isabelle, Pre Study Interview, 2003).

I enquired as to what specifically could be done with computers and technology, "well we would definitely teach them how to surf, how to find information, how to do biography with the Internet, how to look for pictures and be able to bring them into their research and look through different sites" (Isabelle, Pre Study Interview, 2003).

I asked Isabelle to describe how Matt current solves problems in the class and what he does when he approaches new tasks. She stated:

> Well, when we start I always come back to research I always give them some kind of timetable to follow, it's not a timetable but I can't find the English word (outline I suggest). Yeah an outline. So I give this to everybody and you could start by going to the library and I always give them ideas and with that they start. They pick the people first then they run to the computers, they run to the library. Some of them will interview their parents. Some of them will interview other teachers. Some of them will take out books. So I always give them choice to do their research the way that they could present it. They could present it with a PowerPoint. They could present it on the overhead. They could present it by just standing in front of the classroom reading their research making sure that they are always looking to the audience. (Isabelle, Pre Study Interview, 2003).

I asked as to what method Matt likes to use in class. Isabelle responded that Matt really likes to use the computer, he chooses different sites and he shares his information with his friends. She went on to explain that he is really comfortable with the computer. We discussed the types of activities that Matt enjoys participating in within class, Isabelle told me:

> He really likes to present stuff. For example when we do a book report they always have an activity that goes with that. They just don't go and jump in front of the class and talk about the book they read, they have an activity that is built like a pyramid. Each side of the pyramid is different, for example one side talks about the personality of the book and where it happened and then invent something different like an ending and they share it with the classroom and he really likes to share his knowledge with the classroom. He likes to interact with people. He is a very sociable little guy and he likes it when it's teamwork time. He

> really likes to have somebody that he can go to. Like he won't like to be paired up with somebody that doesn't read as well as him or feels there no time to be wasted with that. He's not going to be the one that is going to take the time to help them out. He's more, I'm on a roll, I'm ready to learn, I don't have so much time to give you to explain over and over to you. Again, some of the kids would like to do that but Matt does not like to do that. Like I see it a few times where you know he gets frustrated cause the little one is not following. So I've seen that a few times. When he has somebody who can follow and knows what to do then he's okay working in a team but he would prefer to work by himself if he had a choice. He really likes to present. (Isabelle, Pre Study Interview, 2003).

I verified with Isabelle that Matt finds it frustrating to work with other students. She expanded her statement with:

> you know in the classroom, you know some of them can but sometimes I don't give them the chance to be with the one they like to work with all the time, so then he gets frustrated but I mean it's the same level of learning but I find it's good for him to work on that, too, just to realize that you know I'm not fair all the time and, yes, that some of our friends need help. We did that a few times, not very much, but he really likes to go for it right away, you know, get right on it, on the project, and not waiting for the one that has a rough time… None are ready but he is already ready and the planning is in his head. So when he pairs up with that kind of student then Matt he loses his patience. You know losing time to explain again what I just said, then you will see him "madam, madam can you come over explain it to him so that I can start and when he is ready we will work" You know, I've seen that a few times. (Isabelle, Pre Study Interview, 2003).

I wondered whether Matt had problems with his classmates in the non-academic setting as well. Isabelle negated this idea:

> Non-academic? I think he's, I'd call him a leader. He's really like that. He's not into problems that happen at recess he's not like, oh he did that to me or, in sports, being competitive. He's really good with that section, he can take more socially that he can take from others (academically). But everybody really likes him. I say he solves problems. (Isabelle, Pre Study Interview, 2003).

I meet again with Isabelle once again after Matt had completed working on his projects. I started by asking whether there were any benefits for Matt for having participated in this independent project. She replied:

> he was always excited to go, even though it was during phys. ed... so if it was a good program for him, certainly, because he was always happy to go and if he wants to go again next year I would say probably. (Isabelle, Post Study Interview, 2003).

I inquired as to whether they noticed any difference in Matt's attitude to his class work:

> Definitely, he was really happy to share it with us. It was a supplement he was happy to learn more about the subject and he was really excited that he could add to the topic, it was really neat for him to do it. I am sure that if the second project would have been presented he would of so liked that. (Isabelle, Post Study Interview, 2003).

I wanted to know how much Isabelle thought computer technology contributed to Matt's learning. She said:

> I think a lot, because he always liked to push his knowledge and he is one of the lucky ones that can do that and technology helped to push him further. The knowledge of this teaching, the basic curriculum stuff I needed to teach him, to push the knowledge, and he always wanted a period or two to go and continue his study. Having that supplement with the computer really helped him. (Isabelle, Post Study Interview, 2003).

Isabelle stated that she didn't see any major differences in Matt as a result of his participation in the independent study. I asked specifically about his interactions with his peer group, she responded that:

> I don't think so, that pullout program would affect the way the students would see him, because when he was being pulled out the kids were not even noticing him gone, because it was phys. ed. Maybe if it would be math where it was more obvious but he knew when to go and where to

> go so it was always done so that no one noticed he was leaving. I think it was more that something happened in his life that made him more retract from the group, you know, something that happened with the peers or that might come back you know hopefully next year. Whatever problem he went through he went through with his peers will hopefully be solved. Something happened somewhere during the year that made him retract from the group. (Isabelle, Post Study Interview, 2003).

I wanted to know whether Isabelle noticed any thing new or different in how Matt approached his work or new tasks since starting on the project. To this she said:

> He just digs into the projects. He's really really interested in whatever he is doing, so it does not take him a long time to get organized and to start. I never see a few times but not finishing first, you know, he takes his time and he wants his work to be well done. He likes to push the research. You know some of the kids will say okay okay, this is what she asked and this is what I did so I am done. But Matt always likes to know more. (Isabelle, Post Study Interview, 2003).

Specifically I asked whether there has been a change since the work on the projects. Isabelle stated that it had stayed the same throughout the year.

Isabelle expressed no concerns in regards to the approach requiring any extra work. She did say that if he had been taken out of a core course as opposed to phys.ed that it might have been more laborious for her.

I concluded the interview by asking Isabelle what she would change if the program were to be offered again next year:

> For benefits I would say the need for him to present an elongation (extension) of what we had learned together. I am sure that with the next project will be great to see next year and hopefully will open him to the classroom and his peers and I think the students knowing more what he is doing. (Isabelle, Post Study Interview, 2003).

Chapter 5 - Discussion

Introduction

This chapter will address the findings from the research and how they pertain to the research question "What might be discerned about how the learning, involvement, and motivation of gifted students are affected by an independent exploratory learning program involving computer technology?" and the subsequent sub questions.

- What can we discern about how students are learning in this exploratory computer based setting?
- What can we discern about students' involvement and motivation in this exploratory computer-based setting?
- In what ways does each student's use of the available software applications augment or hinder his or her learning, involvement, and motivation?
- What aspects worked well in this study and what changes should be considered if a similar program were to be used again within this school?

Each section in the discussion addresses the themes that become apparent when analyzing the data. The results are discussed in the following sections – Student Learning, Student Involvement and Motivation, Impact of Technology and What Worked Well in This Innovation, which can all be directly related to the research or sub question. As the research was being conducted an area that I chose to inquire about was how the students planned their projects. As such an additional section called the Student Planning Process is also included which is an expansion of the question, "What can we discern about how students are learning in this exploratory computer based setting?"

Student Learning

As part of this study I wanted to discern how the students were learning in an exploratory computer-based setting. This was not easy to evaluate from the student

responses. The students had difficulty with reflection and for the most part were not able to demonstrate metacognition. As I interviewed the students the one aspect that the students were able to articulate was that they found conducting the research for their projects most helpful to their learning.

Tom stated that in the classroom he would normally fool around simply because he would be done his work and have time to 'waste', however he stated he had to work much harder researching information for his presentation and that he actually had to know what he is writing about. He further stated "You actually have to know what you are looking for and actually know what you are taking from the internet", (Tom, Post-Study Interview, 2003). Matt had stated that "finding out the information, the reading through is the part that helped me I got to read the stuff and learn" (Matt, Post Survey Interview, 2003). Nick concurred with "probably surfing the net, I learned a lot from those resources" (Nick, Post Study Interview, 2003).

During the interview process I tried to encourage the three participants to be more specific in regards to what about conducting their research helped them to learn. Nick commented about the depth of the research that "right now I am pretty much really in depth. I am really enjoying myself" (Nick, During Study Interview #2, 2003). He also commented that when he actually presented the information it all came together for him. While working on the project he had spent a lot of time reorganizing it "I put it together once and I didn't like it and I just kept changing and changing it" (Nick, Post Study Interview, 2003). The learning came together for Nick at the end of the project, "learning the most about Iraq, it actually happened when I presented it and seeing it all together" (Nick, Post Survey Interview, 2003). Tom commented that he needed to "actually know

what we are writing about so a lot of research is actually done, we look up information like Saddam Hussein's biography, the history of Iraq, causes of the war, things like that" (Tom, During Study Interview #1, 2003) and also "I had to actually read everything before I started to use it and, like, a lot of it you would chop of a piece of what you want and don't want" (Tom, Post Study Interview, 2003). Tom also commented on how he selected the research information to use in his project:

> Yeah what I did was, basically I just looked up key elements that contributed to the war in Iraq, like I would type in cause of the war and see things that would come up. I would read like the first paragraph or so and then I would basically know what it was about and whether it was useful or not and then just take it, sometimes I would get more information then I need so then I would just take it even if it was not relevant so I had back up material. (Tom, During Study Interview #1, 2003)

Matt explained that he had to make decisions at times as to what information he would use because sometimes the information he found were the same as from a different source. (Matt, Post Study Interview, 2003)

Aside from the conducting the research there were other factors that seemed to have helped with the participants' learning. Nick indicated that it was a more visual way for him to learn. He further indicated that he felt it was more beneficial for him because it was more interesting and fun. Nick felt that the combination of a fun way of learning in a visual manner made the project a better learning environment for him compared to the classroom. (Nick, During Study Interview #1, 2003).

Another sentiment was that the use of technology (which will be further discussed in the Impact of Technology section) was fun for a lot of the participants and helped with their learning. Tom stated:

> When you use computers it is more so what you know than what you can just come up with up. In class they ask you questions you answer questions there is not much thinking involved. With computers I can sit there and fool around with any tool for like even hours if you want just figuring it out. There are so many things that you can do on a computer that you can't do on paper. (Tom, During Study Interview #1, 2003).

Matt echoed these sentiments saying "it makes it interesting and like I learned a new thing like how to use a website" (Matt, Post Study Interview, 2003).

Student Involvement and Motivation

One of the key aspects of this study was to determine what happened to student motivation as a result of working on an independent project using technology. The use of the World Wide Web (Smith & Brydges, 1998) and technology (Nugeni, 2001) invites students to be more active in their learning. Shaffer (1998) states that any program of education for gifted students needs to incorporate motivation and the development of technological skills.

This was one finding that was consistently cited by both teacher and student alike that the level of the motivation and involvement in the learning process was significantly increased. Nick expressed that he was more involved in his learning, "I am really enjoying myself. I think it is a great way for me to learn and I am. It is a lot more interesting and fun" (Nick, During Study Interview #2, 2003). Learning the content in a different manner than the classroom setting also helped Nick gain more appreciation for social studies than he had previously:

> This was definitely very fun and it made me see how much fun social studies can be like recent events and stuff because I had a lot of fun

> doing it and it was a nice break from my regular school work, definitely changed me lots. (Nick, Post Study Interview, 2003).

Tom expressed similar sentiments, "I am working a lot harder… and it is a lot more exciting than just reading the paper for like an hour straight" (Tom, During Study Interview #2, 2003). When asked what he liked about the project Tom's response provides an insight into his motivation and level of involvement:

> Basically the whole, it is not just individual parts, it is more centered, it's not just all over, it is not one computer one place the whole time and it is not always the same kind of work and it is really fun. It's lots of things. (Tom, During Study Interview #2, 2003).

Matt echoed similar comments:

> I like pretty much everything about doing it …because it makes it interesting and like I learned a new thing like how to make a website and it's interesting and I get to research and stuff. I like research. (Matt, Post Study Interview, 2003).

I asked the teachers to also comment on the participants' motivation and involvement. Bob Grant commented on what impact he felt the independent study program had on Nick and Tom's motivation and involvement in their learning of the curriculum area. "I think it was pretty good …the motivation for them to actually do it on their time, it probably took thirty hours to do an assignment like that, so I think it had a positive effect on them" (Bob, Post Study Interview, 2003). Bob went on to comment on how they had to put a significant amount of effort into the project and this would not be possibly without Tom and Nick being motivated.

Isabelle Leroux saw similar motivation in Matt. She commented that Matt was always excited about going to work on his project. "It was a good program for him

certainly because he was always happy to go … he always wanted a period or two to go and continue his study, having that supplement with the computer really helped him" (Isabelle, Post Study Interview, 2003).

I noticed as I observed them that all three were thoroughly engrossed in the work they were doing time and time again. The following excerpts from my observations highlight their level of involvement:

> When I arrive at the computer lab, Nick is all alone working at a computer situated approximately in the middle of the lab. He works with head in one hand, tilted to the screen a mere few inches away, intently trying to fade out text in his Flash presentation. Nick continues to work in this fashion for at least three to four minutes and then puts on a pair of headphones. He plays the Flash segment watching earnestly and when he reaches a certain section he pauses and replays the interval a few times. He thoughtfully removes the headphones and returns to the head in one hand position and starts to tweak the section he has just been replaying. At this time another class enters into the lab, Nick looks up briefly scanning the class to see who has entered, he returns quickly to the work at hand with no comments or acknowledgements made to those that have just entered. Nick seems oblivious to the constant chatter that now surrounds him as he stays focused on the tedious task of making minute almost non-detectable changes to the fading text in his presentation. Nick is momentarily distracted when one of the other students in the lab asks him for assistance with the software program they are using. Nick swiftly gives the advice the student seeks and returns to the presentation instantly engrossed on his painstaking changes. Nick continues to work tweaking and then checking, taking on and off his headphones, replaying the piece, for forty five minutes until the period ends he continues to work intently in this fashion. (Observation Field Notes #5, 2003).

> Tom is in the computer lab as are his classmates and his brother Nick. Tom and Nick are seated a little apart from the rest of their peers, but close to one another in the back corner of the lab. Despite their relative closeness Tom and Nick are working quite independently of one another. Tom has one foot up on the chair beside him; he faces the computer in front of him working on the finishing touches to the text on a webpage he is developing. Once completed he leans back and rocks in his chair surveying the final effect on the page. Unsatisfied he

starts to tinker with the color scheme, making slight adjustments to the shade of tan on the page; he continues to work in the same position one leg up on the chair beside him while he leans back with hands ready at the keyboard. It takes Tom about ten minutes to achieve a shade of tan he is satisfied with; contented he carries the color scheme forward into the rest of the pages of the website. For the entire thirty-seven minutes that I observe him he works tirelessly on the webpage, adding text, moving images around and adjusting colors. He speaks to no one, not even Nick on his right; he remains steadfast in his determination to achieve the desired effect on his website. (Observation Field Notes #7, 2003)

Matt is the solitary figure this morning in the computer lab. He sits near the front on a computer just off from the vacant teacher's desk. Matt is always upright and erect in his posture when he works and today is no different. He has with him a disk that he informs me contains all the text for his Spiderman site that he has typed at home over the course of the week. Matt pulls up the partially completed pages of his website in Dreamweaver. The background, titles and images have all been placed already; today Matt is inserting the text to complete the webpages. He starts cutting and pasting from his disk into the pages. He makes no attempt to format any of the pages at this time he simply is adding the information. The site contains eight pages, a plethora of facts about Spiderman, from his family to his arch enemies. Matt has written three to five paragraphs for each page. Once all the text has been added, Matt chooses one of the pages to format, the page on Spiderman's superhero abilities. Matt changes the font size and face. He experiments with a few different styles before he settles on a Comic Sans MS font face in size 12. His background is quite dark with images of the red and blue Spiderman in the background. Matt struggles with finding a font color that works against this background and after trying at least fifteen different colors he settles upon a light baby blue that can be read against the backdrop of the page. It has taken Matt almost twenty minutes to find the font style that he feels assured works well with the page. Matt changes the title on the page to match the font he has selected and moves onto the other pages, mimicking the changes to each. Matt is engrossed in the esthetics of the page for the entire forty minutes I observe him. His focus never waivers he sits posed and proper, almost stately in front of screen patiently making small incremental changes until he achieves the desired effect. (Observation Field Notes #9, 2003)

It was clear to all involved in this project, students, teachers and researcher alike that without question the students were motivated to work and deeply involved in their projects. Their focus was almost unbreakable each and every time I observed them.

Impact of Technology

Another goal of this study was to explore the ways each student's use of the available software applications augmented or hindered his learning, involvement, and motivation. The nature of the study itself meant that the students were to use technology. It was therefore important to determine the participants' attitude towards computers before the start of the study, to be better able to make sense of the impact of technology on the participants. The students were asked what role they felt that technology played in society today. Matt responded with "I think maybe they are just good for business to be helpful because most offices you know their business places have computers" (Matt, Pre Study Interview, 2003). Nick stated "I think that computers and technology have a really big role in current life we use them a lot and most companies and stuff depend on them for organization of their products" (Nick, Pre Study Interview, 2003). Tom felt "their role right now is that it is pretty much optional. Like most things are done on the computer except for a few old fashion type things" (Tom, Pre Study Interview, 2003). The participants were further asked what role they felt technology would play in our society ten years from now. Matt responds with, "computers might be doing stuff for us, like making coffee and getting us cereal like robots, that's kind of stuff. I don't maybe I don't know if they will change much" (Matt, Pre Study Interview, 2003). Nick felt that "I think even later as the world continues we will be more dependent on computers and people

will start to get lazy but the world will be run smoother and efficient because computers can do that" (Nick, Pre Study Interview, 2003). Tom predicted a more substantial change:

> Ten years from now computes will ultimately take over the planet everything will be done on the computers and Internet, everyone would have personal computes it would be all digitalized and basically it would probably be that you can't do nothing without it. (Tom, Pre Study Interview, 2003).

The participants all acknowledged the role of computers in society today but primarily as a business role, they saw the future as a time when computers would add to individual comfort and support. None of the participants discussed the role of computers in education or as an integral part of their daily lives, although they all enjoyed using this technology. Given this, I felt comfortable that their current perceptions would not significantly hinder discussing the impact of technology on the participants' individual experiences.

The students readily accepted the challenge of learning new technology to complete their projects and stated the acquisition of these new skills as positive aspects of their experience, "I like making the website because I never made a website before, so I can't wait until I am done so I can load it on the Internet" (Matt, Post Study Interview, 2003). Although only in Grade 3, Matt learned the basics of Dreamweaver in a matter of minutes and exulted at making his first website.

The students did not seem to experience any frustration with the software they used in their projects. Nick was happy to be using multimedia software, "I get to go in the computer lab which I like and I actually get to research and make a multimedia production about the war on Iraq… it is good in that aspect"(Nick, During Study Interview #1) and "What I like about the project is that it is a great way for me to express

my opinions and views through a Flash animation, it is something I really like to do and it is fun" (Nick, During Study Interview #2). Tom expressed the benefits of using the software applications, "It was a lot more efficient using the computer, especially using the Flash animation and the website and it is a lot more exciting than just reading the paper" (Tom, Post Study Interview, 2003).

It was clear to me through the statements they made and their attentiveness while they worked that the students' involvement and motivation was increased from the use of the computers and the various software programs.

There was also some evidence to suggest that it had an impact on student learning in addition to their motivation. As previously stated in the Student Learning section, Internet research provided the most technology impact on the student learning. Isabelle Leroux and Bob Grant both discussed the role of Internet research as a means of pushing the students beyond the curriculum. Isabelle noted with Matt that:

> because he always likes to push his knowledge and he is one of the lucky ones that can do that and technology helped to push him further the knowledge of his teaching... the basic curriculum stuff that I need to teach him, but having that supplement with the computer really helped him. (Isabelle, Post Study Interview, 2003)

Bob Grant also expressed using the computer to push Nick and Tom further, "I am trying to get them to work in the (computer) lab as much as possible, I am trying to get them to think beyond what the books say or curriculum allows" (Bob, Pre Study Interview, 2003).

There were other aspects of learning that were also enhanced through the use of technology. Nick stated that developing the multimedia presentations were especially beneficial to his learning because he is a visual learner (Nick, During Study Interview #1, 2003).

The impact of technology played a significant role in student motivation and I am not sure that the program itself would have been as successful if the learning and presentation development had not happened using technology. Tom summed it up best when he replied to this question I posed, "Would you have been as enthusiastic about this project if you had not used technology?" his response was simply, "No, not even close" (Tom, Post Study Interview, 2003).

What Worked Well in this Innovation

The students at the time of this study received no enhancement or changes to their programming based on their giftedness. With the limited resources and rural locale of the school, providing enhanced programming was difficult. The school wanted to find an innovative and effective program to help enhance the educational experience of the gifted student. This was reflected in another goal of this study which was to determine what aspects worked well in the students' projects and what changes should be considered if a similar program were to be used again within this school.

The participants worked independently to research a topic relevant to what was being taught in their regular class and then presented their findings in a computer-based presentation. The actual program developed for each individual student was loosely based upon Stettler's (1998) modes of learning using technology. Students worked through the four modes of learning (acquirer, retriever, constructor and presenter) with a target of the students proportioning their time allotment to 10% acquirer, 20% retriever, 40% constructor, and 30% presenter of information to place more emphasis upon the constructor and presenter modes of learning. At the end of the projects students were asked to estimate the amount of time they spent working in each of the modes, the results

are listed in the table below.

	ACQUIRER	RETRIEVER	CONSTRUCTOR	PRESENTER
MATT	10%	10%	15%	55%
TOM	20%	10%	30%	40%
NICK	7%	5%	75%	13%

What is important in these findings is determining the amount of time spent on the constructor and presenter modes of learning. There is a clearly defined line between acquirer/retriever modes, representing lower levels of cognitive skills versus constructor/retriever modes. The target was for students to spend 70% of their time working in these latter two modes as it was felt that higher cognitive skills would be used in these modes, thus challenging these students. Matt worked 70% of his time between the two as did Tom and Nick spent 87% of his time in these modes.

Students and their teachers were asked to reflect upon the approach taken and to share what worked and what could be improved upon with regards to the program. In terms of what worked the following comments were shared:

Tom

- You can better understand a topic by doing the research for it yourself.
- The project as a whole was a lot more efficient because technology was used.
- Would like to spend approximately 40% of course work time doing this type of work.
- I like the whole of it, it is really fun and it is a lot of things that make it great.

- This is an exciting way for me to work and showing our talents.

(Tom, Post Study Interview, 2003)

Nick

- This was a fun way to learn and I can see now how fun Social Studies can be.
- It left me feeling more positive about school.
- Would like to spend approximately 60 to 70% of course work time doing this type of work.
- My opinion about Social Studies has definitely changed, before I found it to be boring with a lot of textbook work but since doing this project I think it is really cool. It made Social Studies a lot more fun and easier for me to learn.

(Nick, Post Study Interview, 2003)

Matt

- It makes it interesting and I like learning new things like how to make a website.
- I would like to do more of these types of projects.
- Would like to spend the same amount of time (one period a week) doing this type of work.

(Matt, Post Study Interview, 2003)

Bob Grant

- I think the program was pretty good, their motivation to do the amount of work they did was a lot. I think it had a positive effect on them.
- I definitely think it made them more excited about Social Studies.
- I think this type of work will definitely help them lots in the future especially at University.

- It did not require any extra work on my part.
- In Social Studies I think you could give up quite a bit of class time for them to do this type of work, because what they got out of it in terms of finding the information and looking at both sides I mean that is invaluable.

(Bob, Post Study Interview, 2003)

Isabelle Leroux

- There was such a benefit for him (Matt) to be able to present an elongation (extension) of what we had learned together in class.
- If I were his parents I would really really like for him to keep working on these types of projects. For a special kid like Matt that has a lot of potential as I parent I would be really excited about this.
- He really likes to dig into projects now, he's really interested in what we are doing and it does not take him long to get organized and to start. He takes his time and he wants his work to be done well, he likes to push the research.

(Isabelle, Post Study Interview, 2003)

It was evident from the comments that there was reason to believe that this project approach taken worked well with these gifted students in this environment. There were positive benefits seen by both parties in terms of the students' interest in the curriculum area, their motivation and their enjoyment of learning. All participants wanted to have future opportunities to participate in more of these technology based independent learning projects.

All participants and their teachers were also asked to comment on how the project could be improved if offered again. There were suggestions to involve other students

(Nick, Post Study Interview, 2003; Isabelle, Post Study Interview, 2003); to push the students even further by predicting future impacts of current events (Bob, Post Study Interview, 2003); and to allow the work to occur during option time (Isabelle, Post Study Interview, 2003; Nick, Post Study Interview, 2003).

Student Planning Process

As I conducted the interviews and observed the students work I became interested as to how the participants planned their work, and whether working in this fashion changed their planning process. I wanted to discern if possible how they were constructing their learning, to get a sense of how they sorted, categorized and interpreted their research so I could better challenge these students in this type of learning environment in the future.

Although I questioned the students repeatedly in regards to how they were planning their projects, the findings in this area were sketchy to say the least. The students seemed to have difficulty articulating how they planned their projects and further how they interpreted and used their research findings. Nick for example stated:

> when I plan out a project I usually just make sure that I have all my information and then I just group it together, I don't really plan it out that much I just go with it and I just kind of tie it all together and make a report. (Nick, Pre Study Interview, 2003)

Nick was not able to explain how he groups and ties information together. Tom had similar ideas on project planning:

> If Mr. Grant gives us research and we need to report about it all I would do, I don't really plan research I just go on the computer and find information. I would just write it on rough copy paper and then just type it as I go later and make up half the things as I go along. (Tom, Pre Study Interview, 2003)

Matt being a significantly younger student than Nick and Tom was heavily dependent on his teacher to provide guidance and structure for project planning:

> We don't usually plan projects, like the teacher tells us what we have to have if they are, like, PowerPoint and then just do the stuff she tells us. The teacher will give us pieces of paper and tell us how to set it up. (Matt, Pre Study Interview, 2003)

I continually inquired as to whether their planning processes changed during the course of the project. Nick remained steadfast in his just throw it together approach:

> For this project I didn't really plan the project I just kind of threw it all together in my head and I kept changing stuff, for the future I would probably do the same. I don't really like to plan projects and stuff because I like to have fun and I can do it just as good in my head. (Nick, Post Study Interview, 2003)

Tom however changed his approach for this project and had an epiphany of sorts:

> I find it a lot easier not just to work as you go but to organize yourself before. It makes your work a lot more efficient. You know what you are doing first before you start doing it. I will actually start planning my projects better, so I know what to actually expect and how much time I have to do it and stuff like that. (Tom, Post Study Interview, 2003)

Matt struggled with planning having been constantly dependent in all his previous endeavours on direction from his teacher. He did like the freedom of doing his own planning however, he was more secure in the outlines normally provided by his teacher, given his young age this was not surprising.

The students seemed unable to articulate how they planned their work. There was most certainly a process occurring but it was simply expressed as an 'I just do it' mentality. This was detrimental to being able to analyze how the students were constructing their learning. As previously stated in the Student Learning discussion section the greatest impact on learning seemed to be due in most part to the analysis of

the research material and evaluating its worthiness and usefulness within the presentation. How specifically this was happening and how they were organizing what they learned could not be determined from the research collected in this study.

Chapter 6 – Conclusion

My Thoughts on What This Means for the Students and the School

After completing this study, analyzing the results and reflecting on the entire process there are two themes that resound for me. These themes are the level of involvement and motivation of the students and the success of the program approach in meeting the needs of these students in this environment.

Throughout the interviews and the observations what was always apparent was that the students were motivated and involved in their learning. These students who were often bored in class now looked forward to working on a project directly related to their curriculum area. The technology aspect definitely appeared to play a large part for these students as they repeatedly commented on the fact that they liked working with the multimedia software. All the students had opinions on the role of computers in society as evidenced by the pre-project interview data. All the students expressed enjoyment in working with computers prior to starting this project and one even wanted to be a multimedia developer. The fact that the students enjoyed computers might have had some impact on their very high level of involvement and motivation seen in their project work.

The question that does need to be asked is whether the motivation and involvement could be maintained with subsequent independent learning projects for these students in this environment. This obviously was a new and different opportunity for these students. They previously had little opportunity to receive individualized programs. They were given a fair amount of responsibility as well as freedom. Although all students stated they would want the opportunity to do more of these projects, Tom and Nick indicated that they preferred a significant amount of class time dedicated to this type of

work. Time and further observation would be required to determine whether the positive benefits seen from this project could continue at a significant level with repeat projects. I would strongly support further independent learning opportunities using technology with these and the other gifted students at Beaver Ridge School.

The second theme I wish to discuss is the success of the program approach for these students. As previously stated, little individualized programming has been afforded these students in the past. Significant planning and research was done to determine the best approach to use given the educational context of these students. The program that was developed seemed to have a positive impact on these students. Students with little guidance from their teachers meet the goal of working in the higher cognitive level of the constructor/presenter mode for 70% of their time. They were motivated to learn and the high school students, in particular, enjoyed the independence. In future projects I would want to implement some guidelines for the students to ensure that their high level of motivation and involvement continued. I strongly believe that the students need to evaluate, analyze and synthesis in these projects. This process lends itself heavily to a better understanding of the content and more involvement in the learning process.

The teachers in this study were really uninvolved with little involvement and planning expected from them. Ideally, for this type of project to remain successful, the level of planning for the teacher cannot be onerous, but there is potential to explore more teacher involvement to make the projects progressively more challenging especially if the students start to become bored with repeat use of this programming approach. There needs to be continued effort on the part of the teacher to push the students to think critically about their work. The teacher needs to assure that the students are continually